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AN OCTAGONAL MUSIC CABINET.

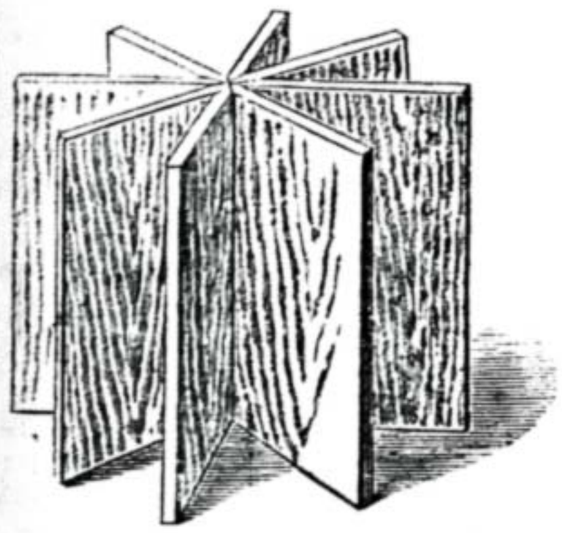

Fig. 6.—Carcase Boards at Top of Music Cabinet.

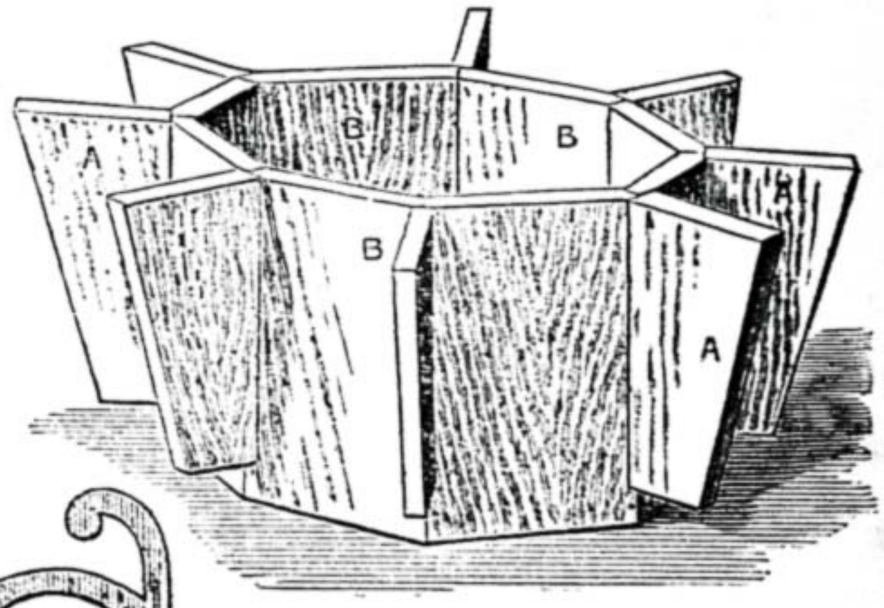

Fig. 7.—Carcase Boards in Central Part of Music Cab net.

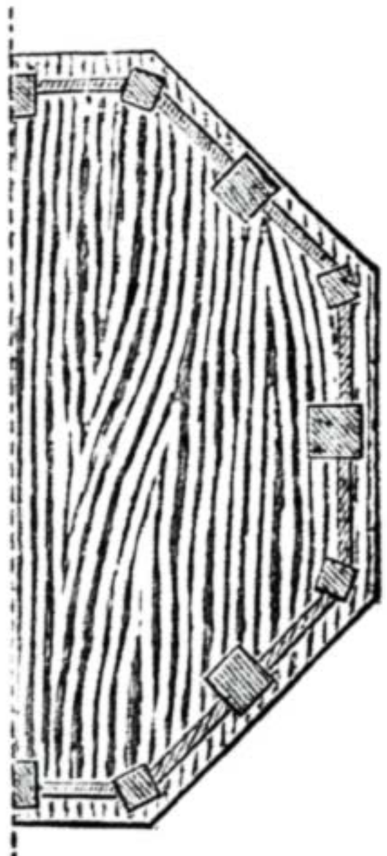

Fig. 5.—Position of Pillars shown in Plan.

Fig. 4.—Method of cutting Octagonal Table Top, etc.

Fig. 3.—Appearance of Sides: Leg shown between Pillars.

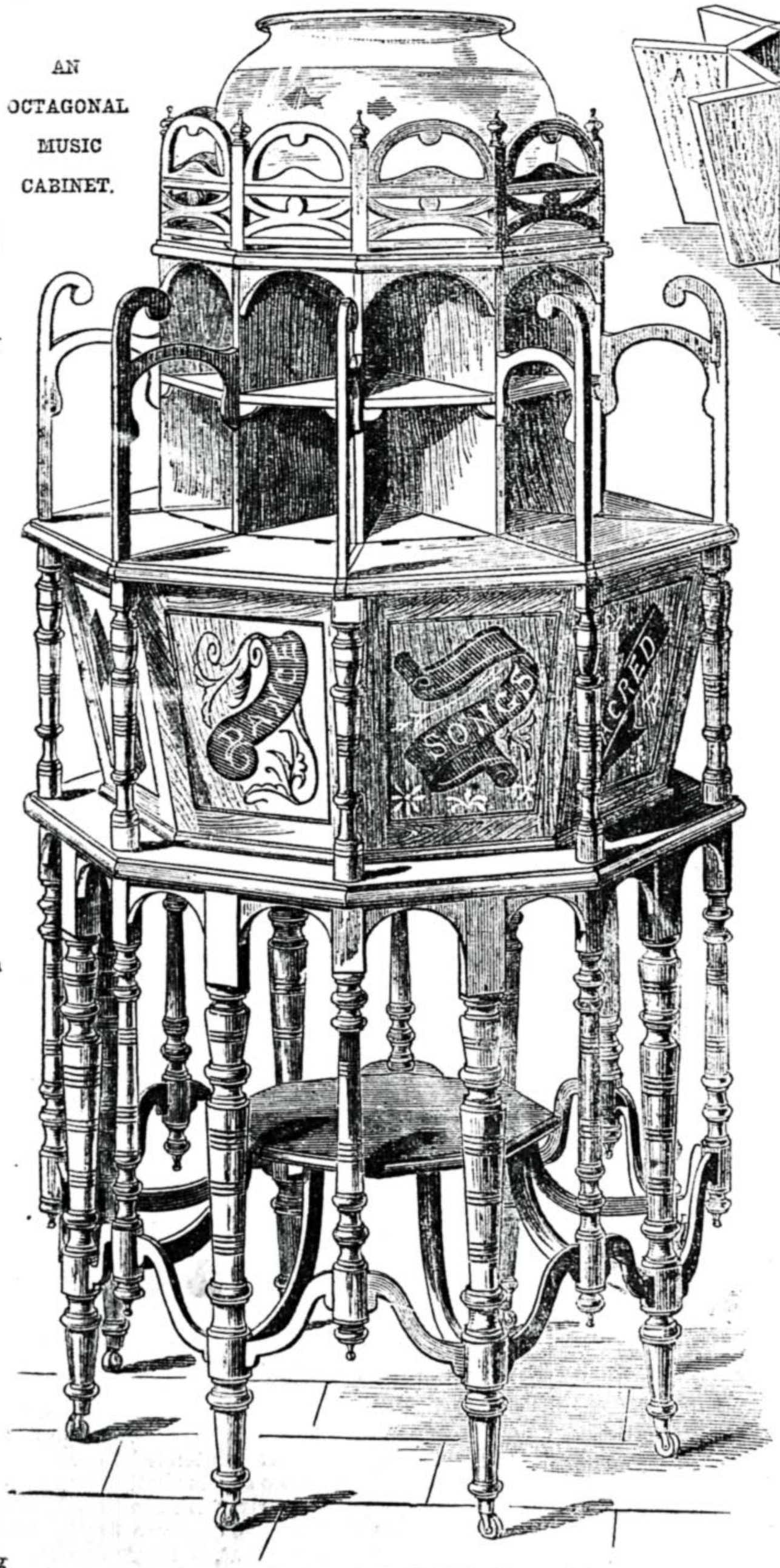

Fig. 1.—Octagonal Music Cabinet complete.

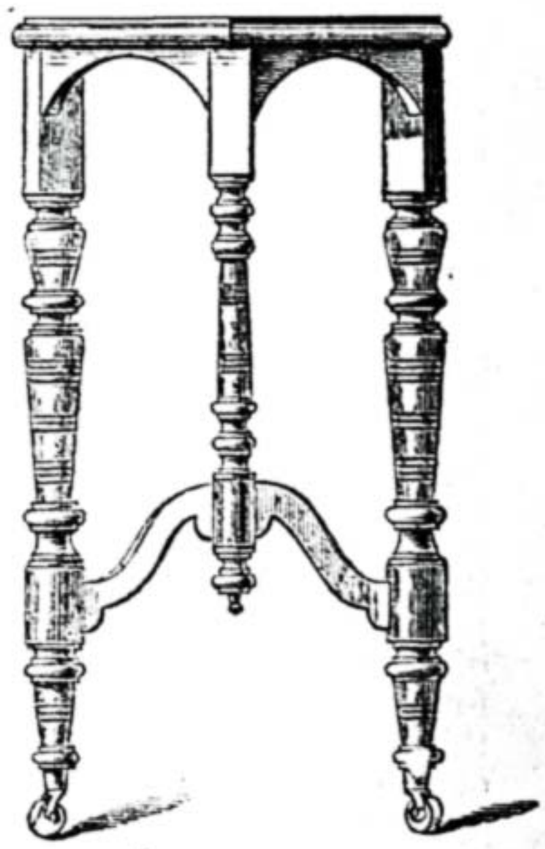

Fig. 2.—Appearance of Sides: Pillar shown between Legs.

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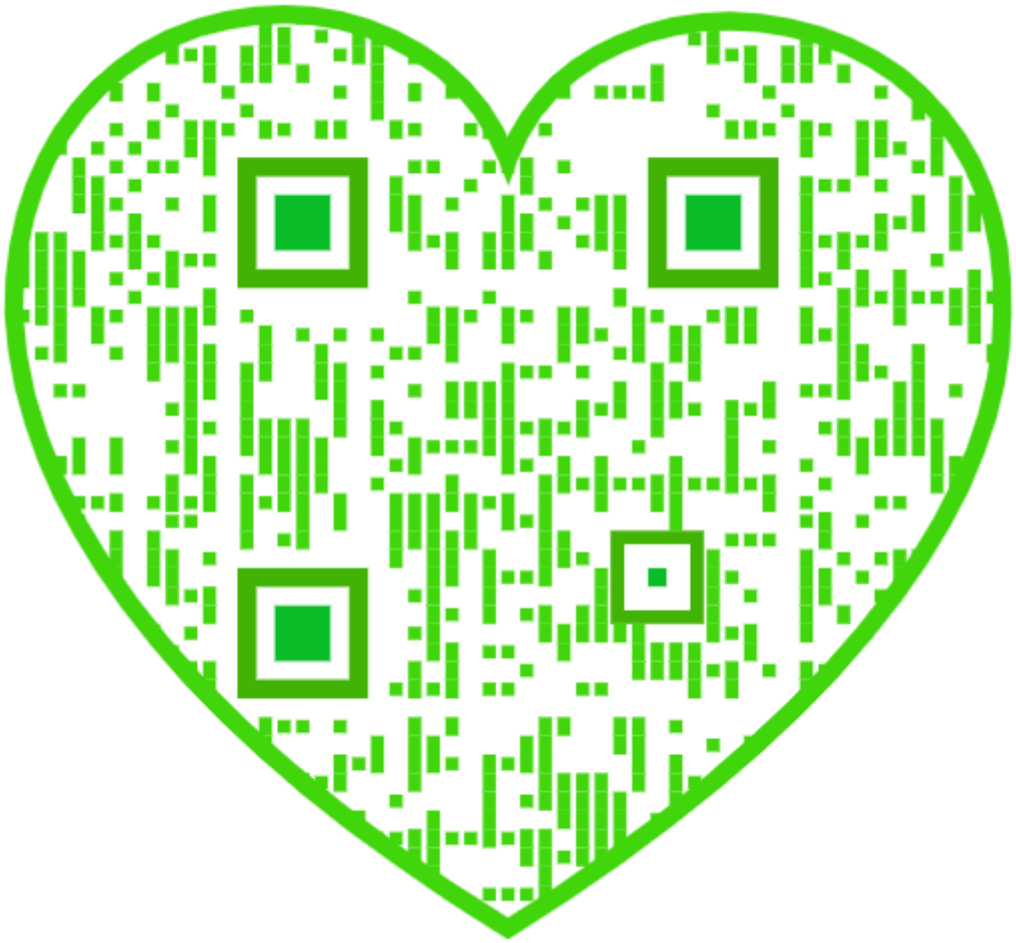

AN OCTAGONAL MUSIC CABINET.

BY JAMES SCOTT.

DURING the past few months I have had several conversations with gentlemen in furnishing circles; and the tendency of the majority of these gentlemen's opinions is that they consider the furniture of the present day is too much of the wall character. By this they mean that more furniture is designed to rest against the wall than to stand in the open space of an apartment. A few moments' consideration of these remarks will show that this is so, and that there is plenty of scope for the designer of the future—or even for him who caters for the public taste at the present time.

Bookcases, music cabinets, china cabinets, sideboards, chiffonniers, sofas, couches, and settees, and several other articles would lose their beauty—if they have any—by being placed at any noticeable distance from the wall. Almost the only things that will stand anywhere with equal effect in appearance are tables, chairs, ottomans, etc.

The advancing and spreading admiration of art is beginning to induce society to clamour for something away and apart from the old lines on which furniture is indiscriminately built. Instead of pictures being hung (as our grandfathers and grandmothers preferred them) as high to the ceiling as possible, modern taste says that they must be hung so that the spectator can admire and criticise them without having afterwards to complain of pains in his neck. Then again, small fancy brackets, mirrors, china, etc., are becoming more numerous in making a very close acquaintanceship with the wall; which, in its turn, is insisting upon having better adornments in the shape of artistic papers, lincrusta, textile hangings, etc.; and also demands that these adornments shall not be hidden from view by heavy—and sometimes not too pretty—furniture. All this shows that there is a way open for the designer to contract admiration by satisfying the present and future "art" cravings of modern mankind.

Why should not bookcases (those mostly used in drawing-rooms, I mean), cabinets, etc., and even sideboards, be constructed in such a manner that they would stand either against a wall or in the middle of a room? One great advantage to be derived from furniture of this kind would be the alteration which could from time to time be made in the appearance of an apartment, by shifting the furniture to different parts of it; and my own experience proves that people soon tire of the one continual look of their rooms—although they may be very fond of their homes, morally speaking. In this reason is to be found, I think, a solution of the question why are persons so fond—apparently so—of shifting from one neighbourhood to another? The different arrangement of the *same* furniture affords a relief and an agreeable change to the eye.

It is sometimes difficult to say whether demand creates supply, or *vice versâ*. I think, however, that in the present instance, contrary to the usual custom, the demand will create the supply. Of course, properly speaking, *demand* must precede supply; for until hunger is felt, thirst is experienced, and the want of necessary articles noticed, the materials requisite to give satisfaction are not asked for. When, however, supply increases, it not only fully satisfies *present* demand, but creates *future* demand. Let us hope, then, that although the public is asking for improvements in its furniture, our designers will see the reasonableness of it, and will endeavour to satisfy it in the present and create it in the future.

My design for a music cabinet, to stand in any part of a room, is a departure from the old lines; and will doubtless be agreeably accepted as such. The average amateur may eye it with a feeling akin to displeasure, as he may imagine that the amount of skill requisite to build one after this pattern will be above him; but the old proverb, to which the tale of the spider has always been attached, should be fully considered before finally deciding to pass the design by.

So far as the cutting out of the various parts is concerned there is nothing that an amateur should not be able to accomplish; it is in the fitting together of the different parts and pieces that his ability and patience will be tried.

There are several advantages to be gained by the use of one of these cabinets. First comes that already mentioned: placing it with equal effect in any part of a room; then we have a handier access to the music sheets. It is a fact that, although the music sheets may be stowed away in an ordinary cabinet, when they are being used they present an untidy appearance by being cast indiscriminately about piano, tables, chairs, etc.; as the person, in endeavouring to find a particular piece of music, will not take the trouble (not on account of indolence, but of impatience) to put those not wanted back into their accustomed place. It is intended that, in this cabinet, the music sheets shall *stand up*, almost perpendicularly, with the titles uppermost; and, as I have designed it so that they will be on the slant, if they are placed with the titles to the front, any particular piece of music can be easily found without necessarily taking out the whole quantity. And, when each compartment is really full, there will always be plenty of space at the top to enable the books to be pushed back one by one until the required piece is found.

There are more compartments (eight) than are really necessary; but readers of WORK, or of any other periodical, will find a convenient place or two in which their favourite journals may comfortably repose. As each compartment will have a lid, the contents within them will be kept comparatively free from dust, etc. The front of each compartment will, of course, be wider than the back, and it would be an impossibility to open the top as a lid if more fretwork than I have shown is used on the sides. The narrow upright I show will not hinder it from working, and the arch will be too high for it to come into contact with it. Of course, all the lids will not be able to be opened at the same time.

Another thing I must speak of before I begin with the sizes is the appearance of the columns. Any beauty the article may possess will be lost if a less number than I represent are used under the table part. I show sixteen, eight of them shorter and thinner than the others.

The difficulty to be overcome, too, of getting the pillars and shaped pieces between properly and nicely fitted, must not be lost sight of. If they are fixed as in Fig. 1, each side of the octagon will have the appearance of Fig. 3, and the shaped pieces at each side of the long pillars will be at an angle with the pieces adjoining them, as in Fig. 5. If, however, the shorter columns are fitted in the centre of each side of the octagon, the pieces can be more easily joined, and the appearance of each side will be as in Fig. 2. Now, then, we will enter upon the construction.

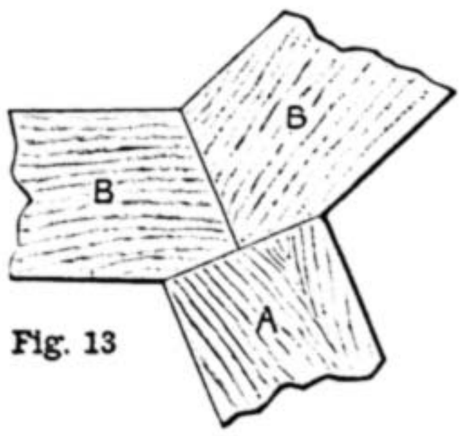

Fig. 13

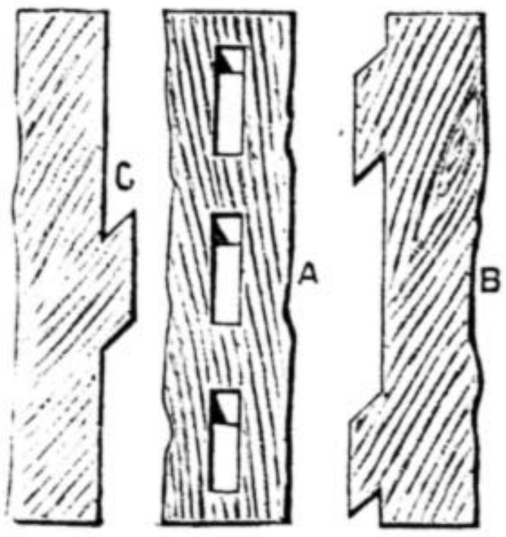

Fig. 11. Fig. 12. Fig. 10.

Figs. 8, 9.—Two Methods of joining Boards in Fig. 6.

Figs. 10, 11, 12.—Method of making and tenoning Boards in Fig. 6 if desired.

Figs. 13, 14.—Angles formed by Boards in Fig. 7.

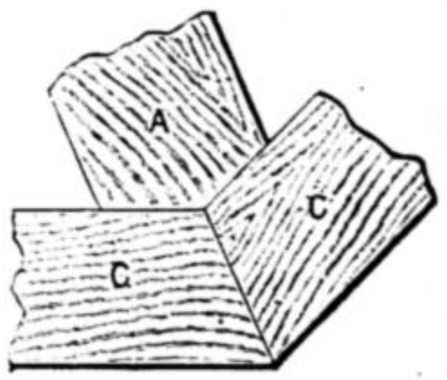

Fig. 14.

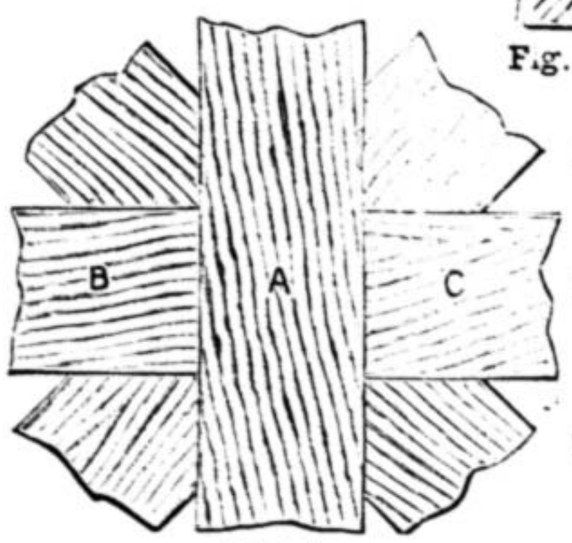

Fig. 9.

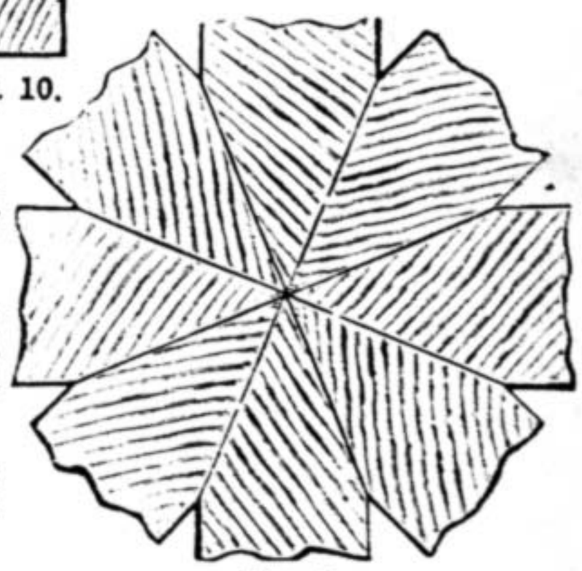
Fig. 8.

The wood and finish must be entirely a matter of choice. The first to be cut out should be the table top. This will be 36½ in. across each way, and will be about 13½ in. on each of its eight sides. It might be ¾ in. thick, with a moulding round its edge. On to this is screwed the upper carcase, of which the inside of the bottom part is shown in Fig. 7. The eight boards marked B, forming the octagon, will each be 15 in. long and 9½ in. wide, and should be canted at the joints as in Fig. 13. From each corner formed by these boards runs one of the boards A in Fig. 7. These will each be 14⅜ in. long, and 5¾ in. wide on top, gradually sloping to a width of 3½ in. at the bottom end. Next, we want a board the same size as the table top, and similarly moulded. Mark off from the edge of this all round a distance of 5½ in., and cut out the octagon (A in Fig. 4) thus formed. From the ring (B in Fig. 4) will be cut the lids for the music compartments, by cutting out a strip half an inch wide from across each corner. The larger parts will be the lids, and the narrow strips will fit on to the top (after being properly cut at the ends for the

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purpose) of boards A in Fig 7, and connect the small turned columns with the boards in Fig 6. The inside octagon (A in Fig. 4) will serve as the bottom board to the eight boards in Fig. 6. Another board, 32 in. across each way, and about 12½ in. on each of its sides, should be similarly cut to this last-mentioned one. The outside ring of this board will form the bottom board for all the compartments, and the back edge of it comes *against the fronts* of boards lettered B in Fig. 7, while the other part of it comes *underneath* the boards lettered A in Fig. 7 and the title boards.

For Fig. 6 we want eight boards, each 14 in. long and 12½ in. wide; they could be united as shown in Fig. 8. If, however, it is preferred that they should be more firmly joined, they might be fitted as in Figs. 9, 11, and 12; one board (A) will then have to be twice the length of the others, and the proper boards will have to be mortised and tenoned as in Figs. 10, 11, and 12. The eight columns round the top carcase might be very slender, as they will not be required for the purpose of strength, and should be screwed to the table top from underneath it. The fixing of the long and short pillars supporting the table, and the various shaped pieces, can be better understood when the article is being built up, as in written instructions a great deal of space must be filled to explain it, and it is unnecessary to go to such lengths.

Small shaped pieces and shelves are fitted between the eight boards in Fig. 6, and some turned ornaments and fretwork are framed up on top. Here will be a nice place for the display of a globe of fish, vase of ferns, or a cage of birds.

Descending again to the lower pillars, as I said before, the appearance of the article will be the better if the eight thickest columns are fitted in the *middle* of each side instead of being in the corners. The length of the longer ones will be 27 in., that of the shorter 18 in. The former might be 1½ in. or 1¾ in. thick, the latter 1 in.

The octagonal bottom board is intended to rest upon eight shaped pieces, and according to the length of these latter so will the height of the former be; and here let me add that if the table top is cut similarly to the other octagon boards, the piece cut from it can form the bottom board.

One or two shelves may be fitted between each pair of boards shown in Fig. 6. The thickness of all the wood used in the cabinet (excepting that of the boards which lay horizontally, which should be ¾ in. thick) is intended to be ½ in.

The title boards will each be 14 in. long, and 13½ in. wide at the top and 12½ in. wide at the bottom. They may be panelled or merely painted.

Before concluding, I must again press on my readers the advice not to have any more fretwork than I show in Fig. 1 within the space traversed by the lids, otherwise the lids will not open.

Now I leave the design with my amateur readers, feeling sure that if they consider an article made according to it worth a place in their homes, they will not be slow in building one. It is also well worth the notice of professional readers, who may, if they will, gain many useful hints for furniture in the designs given in WORK: indeed, this is one of the principal objects for which the Magazine exists, namely, to supply the professional cabinet maker with designs at a nominal price, or, as a man neatly put it the other day, at "next door to nothing."

MODERN FORGING.

BY J. H.

PRINCIPLES OF FORMATION.

THERE is yet another point of view from which the practice of forging must be regarded. Into the alternatives of drawing down, upsetting, and welding the question of strength does not enter, for each operation, when properly performed, produces equally reliable results with the other. The question of strength is—assuming the use of iron of similar quality—one of direction and continuity of grain or fibre. It is very important that, whenever possible, this unbroken continuity of fibre should be preserved intact, and in the generality of work its preservation is not difficult. But it is as well to get certain fundamental and very essential facts impressed upon the mind. The smooth external appearance and accurate dimensions of a forging are by no means sufficient evidence of its suitability for the purpose for which it is required. It may happen that the fibre is wrongly arranged, or that it has not been sufficiently consolidated throughout by hammering, or that it has been overheated and burnt, or that unsuitable material has been selected. It is to the first of these only that the succeeding remarks will have reference.

The most striking characteristic of wrought iron—and also, in a lesser degree, of mild steel that has been rolled—is its *fibrous* condition. This is the quality by which it can be rendered subservient to the will of the craftsman. Anything that tends to reduce or minimise that quality is an evil. It is a remarkable property of these fibrous materials that the very qualification that is of so much value can be changed or modified by the smith. A smith places a bar of iron across the anvil cutter and nicks it around with a chisel. The bar may then be broken short off with little stress, and none but a very practised eye could detect by the appearance of the fracture, which is wholly crystalline, whether the iron were cast or wrought. But if the same bar be bent without nicking, or gradually torn asunder until it breaks, the fracture will be wholly fibrous, the long string-like fibres becoming drawn out as though the bar had been built up of innumerable fine strings of metal. Again, if a crank-shaft or a lever-arm breaks at a sharp re-entrant angle, the fracture will be crystalline. But if it breaks at an angle whose faces are gradually merged into one another with a curve or hollow, the fracture will be partially or wholly fibrous.

It follows from the fibrous character of wrought iron developed during rolling that it must be considerably stronger in the direction in which it is rolled (Fig. 41, A A) than in the direction transverse thereto, B B. The difference is somewhere about in the ratio of 21 to 17—that is, if it would require 21 tons per inch to break the bar through the line B B in a direction at right angles with A A—that is, *across* the fibres—17 tons would suffice to break it along A A—that is, *along* or with the grain. This does not hold good, except to a very slight extent, in the mild steel, where the rolling is only subsidiary to the fusion. In wrought iron this matter of direction and relative strength of fibre has a most marked influence upon design. It shows why the direction in which work is subjected to the greater stress should always coincide with the longitudinal direction of the fibres; why curved work should not be cut from the solid, so severing the contiguity of the grain, if it is possible to bend it round and preserve the fibres continuous. It shows why in many cases it is better to split or divide a bar, and bend or fork it, so preserving continuity of grain, rather than slot out or weld on at random. It explains many points in the practical working of wrought iron as distinguished from the working of the homogeneous mild steels. It shows the advantage of keeping rounding edges, and not sharp edges, on fullering and similar tools, by whose use the grain is not violently *severed*, but rather *moulded*.

Observe the action of the fuller as typical of many others. This reduces the surface of the work without leaving any angular marks upon its surface. It does not *cut* at all, but leaves a wavy surface, with fibre perfectly continuous. And when making a set off in a bar, whether with the object of reducing its dimensions or of bending it, it is always the round-faced fuller—never the keen chisel—that is used. The edge of the set hammer is also usually a little rounding, and does not form a sharp angle. The same is true also of most of the swages and other tools employed in working out moulded forms.

The following drawings are introduced to illustrate in detail these remarks.

Note the two cranks in Fig. 42. A is a crank forged as a solid block, and slotted out at C. B is bent or dipped round. When A is slotted out, the crank webs *a*, *a* are very weak, because the grain or fibre runs in the direction of the shaded lines, and the case is quite analogous to the short grain in wood. In B the fibre follows the contour of the dip of the crank, and the crank is therefore of equal sectional strength throughout. The weakness of the form A is shown very forcibly in locomotive practice. The cranks of inside cylinder engines are made in this manner, and unavoidably so, because there is not room enough to use a bent crank like B; consequently, these cranks invariably fracture through one of the webs (*a*) if they are run over about 200,000 miles. Frequently, in fact, they break before that limit is reached. For this reason the practice of bonding is now often resorted to.

Take again, the crane lifting-hook (Fig. 43). This is invariably turned round like the dip crank—never slotted out of the solid. If it were slotted, the hook would inevitably break at *a*. Being turned round, the sectional strength is preserved, and the effect of excessive stress is to produce only a partial straightening of the hook.

In forging the eye of a winch handle (Fig. 44), instead of making a solid end and drilling and filing a square hole, the bar is bent round a mandrel, and then welded at *a*.

Instead of drilling a hole in the eye of the crane hook (Fig. 43, *b*), it should be turned round and welded, like Fig. 44, or else punched. In drilling, the metal is absolutely severed; in punching, it is thrust aside and not divided at all. And the punching not only preserves the continuity of the fibres, but also, by bulging out the metal upon each side, preserves an equal section, and little or no jumping up is required. The punched rod (Fig. 45) is an illustration of the same kind occurring in the middle of a bar, and is common in roof truss work.

The eyes of hammers, and the cottar ways in bolts and rods, are also properly punched. There is then no separation, but only a parting or spreading of the fibres.

Fig. 46 shows how the continuity of grain is preserved in large forked ends. Small ends are usually shaped out of the solid, but broad ends, like that shown in the

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figure, and also those of moderate width, are formed by dividing the bar and then opening it out. In this group of figures, A is the bar from which the forked end has to be made. A hole is punched through at *a*. The fibre is not thereby severed, but thrust sideways. Then the bar is divided with a hot set from the hole *a* outward to the end. The set is first driven from one face halfway through the bar, and then from the other face to meet in the middle. The punched hole prevents all risk of the chisel or set splitting the fibres too far inwards. Then the bar is opened out, first with a wedge, afterwards with the hammer, as at B, and finally finished as at C. If the fork were cut from the solid, the grain would be short; but being opened out and turned round, it runs continuously.

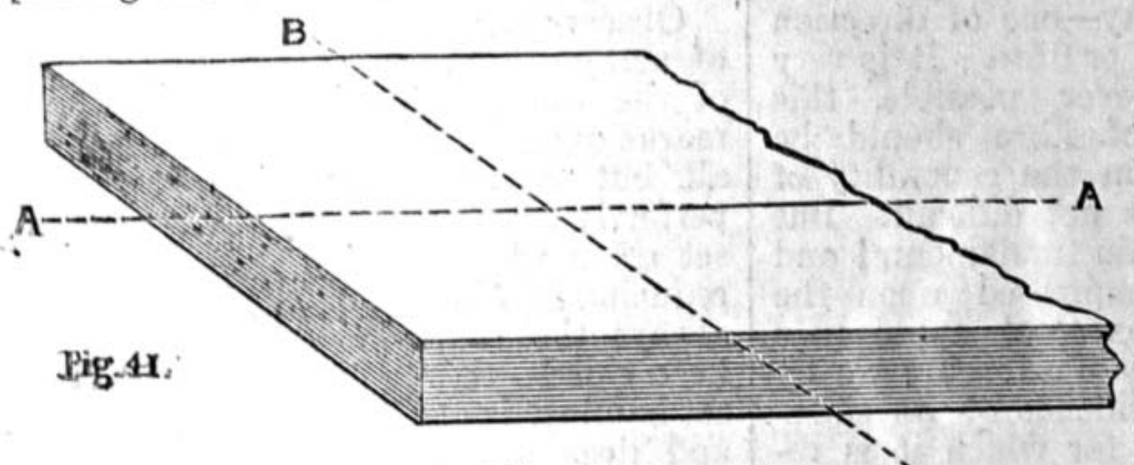


Fig. 41.

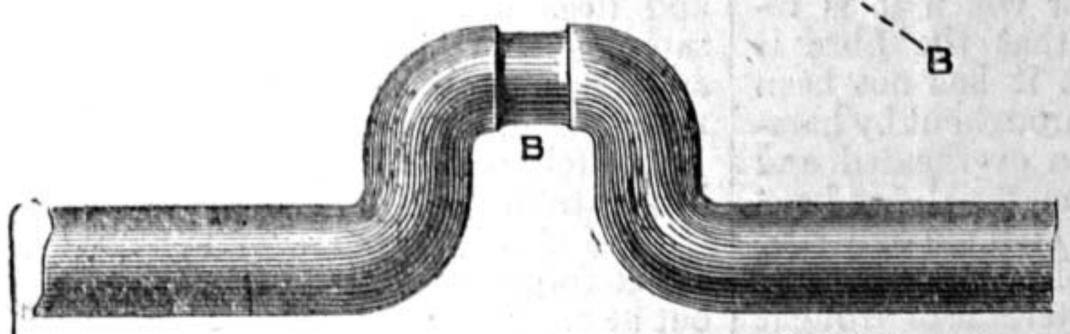
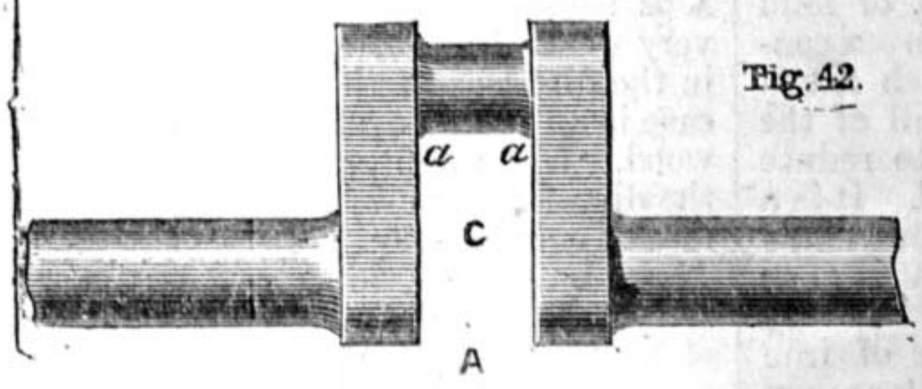


Fig. 42.



The direction in which the *layers* of iron occur has frequently to be considered when making forgings. When making a key (Fig. 47) the layers of the iron should not be arranged in the direction of rotation of the shaft as at A, but at right angles therewith, B—that is, they should run towards the centre of the shaft. In the latter arrangement, the pressure will tend to close them; in the former, the pressure would tend to shear the key off in the plane of the layers. The holes for nuts should also be punched at right angles to the direction of the fibre. If punched in the same plane as the layers of iron, they are very liable to become separated. In the forked eccentric rod end (Fig. 48), when forged solid and slotted out, the layers should not run as shown, in the vertical plane of the figure, but in the plane of the paper instead. By the first method, the grain is apt to open at *b*, and the forked end fracture along *a b*.

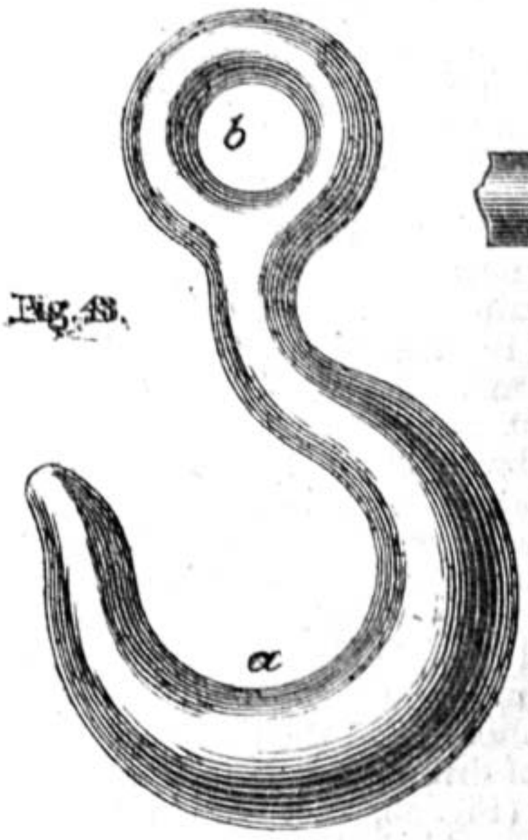


Fig. 43.

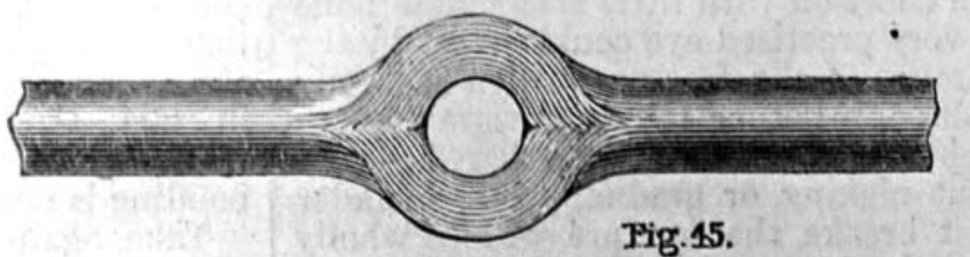


Fig. 45.

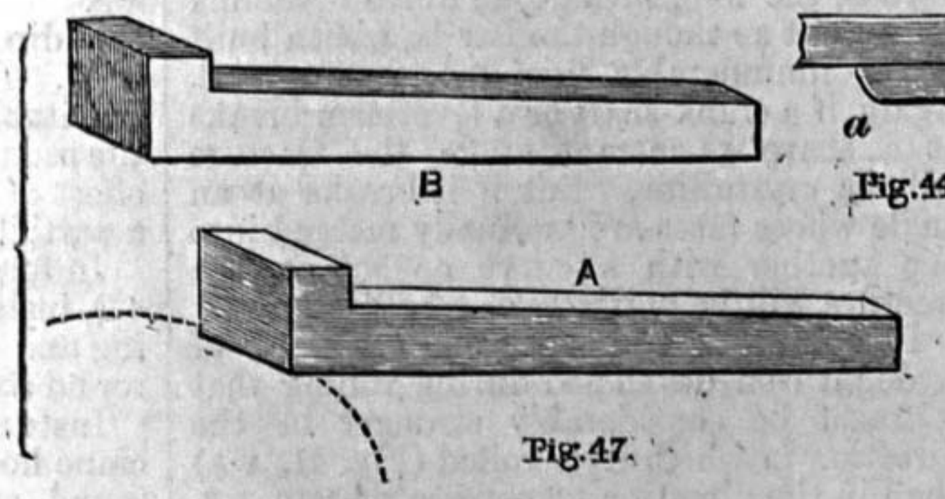


Fig. 47.

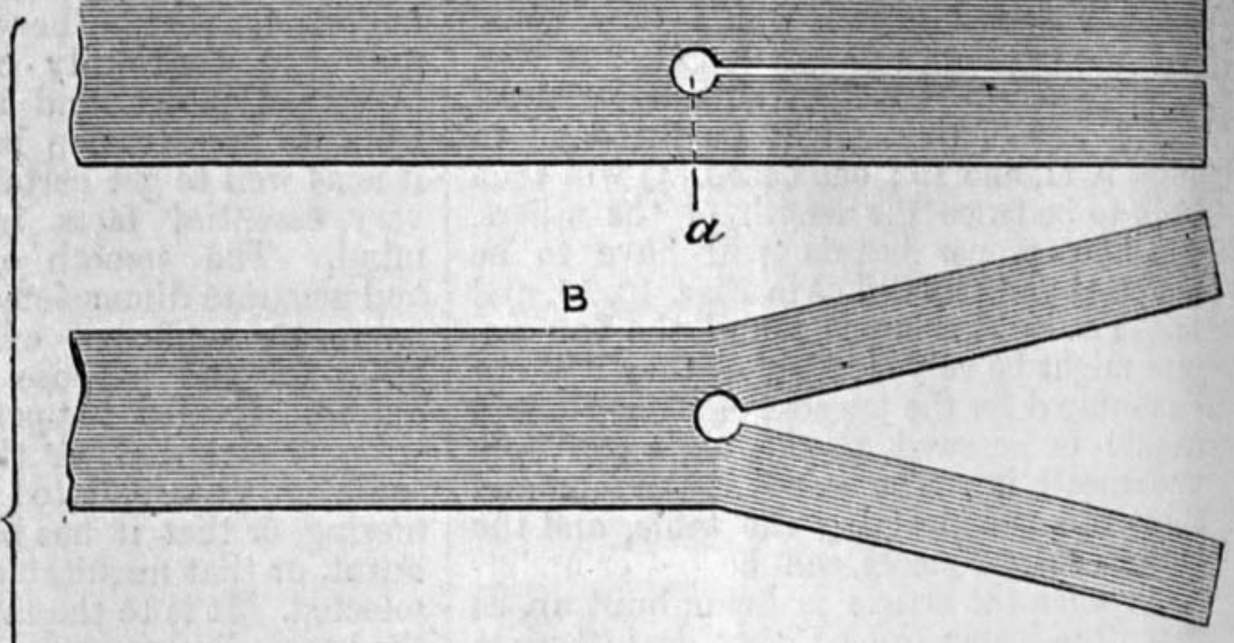


Fig. 46.

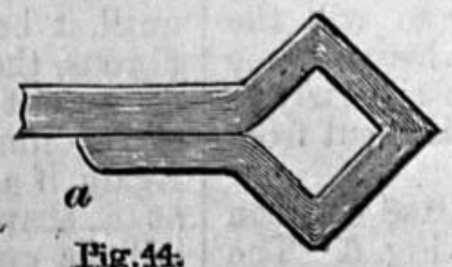
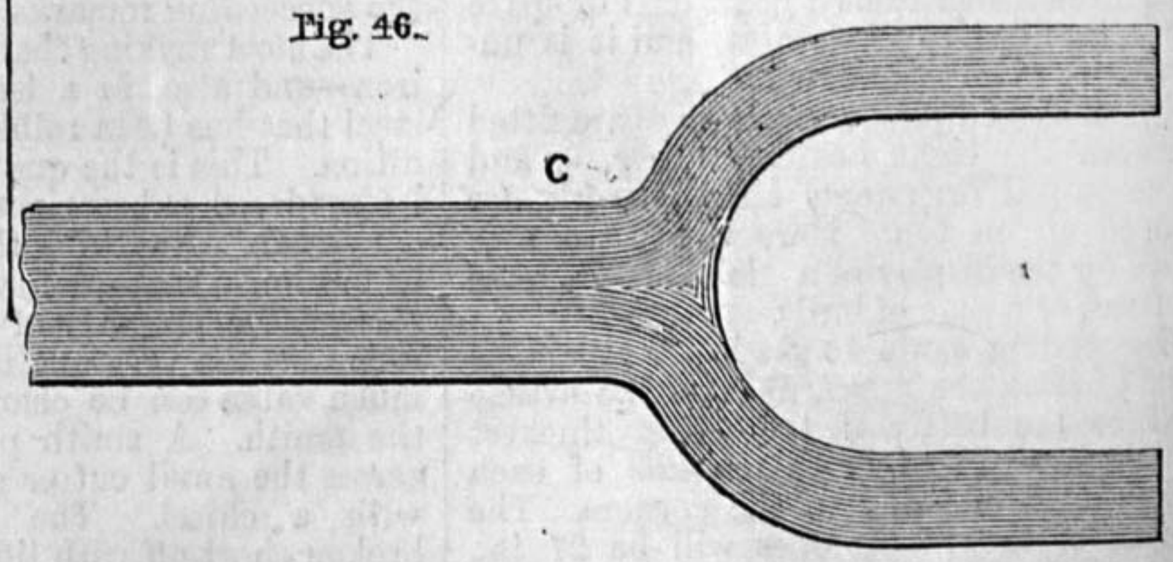


Fig. 44.



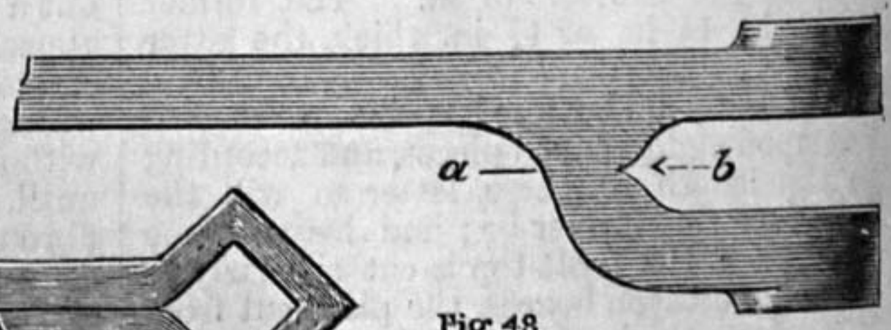


Fig. 48.

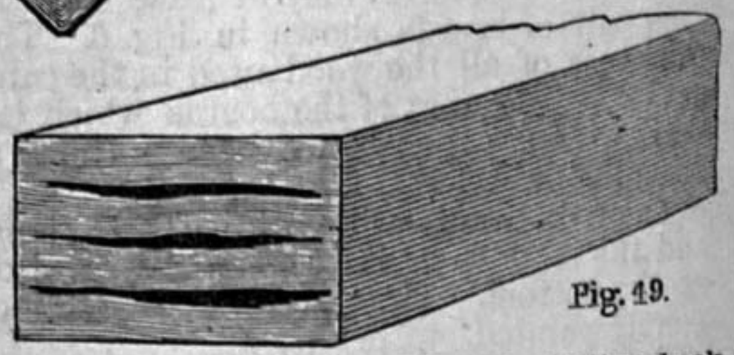


Fig. 49.

Fig. 41.—Bar of Iron shaded to show Longitudinal and Transverse Direction of Fibre. Fig. 42.—Slotted and Bent Cranks. Fig. 43.—Lifting-hook of Crane. Fig. 44.—Welded Eye. Fig. 45.—Punched Tie Rod. Fig. 46.—Forked End. Fig. 47.—Keys shaded to show Right and Wrong Arrangement of Fibre. Fig. 48.—Forked End shaded to show Wrong Arrangement of Fibre. Fig. 49.—Cracks in Bad Iron.

This liability to crack is much more pronounced in inferior iron than in that of first-class quality. Lowmoor iron and the treble best qualities of Staffordshire iron are comparatively close-grained and tough, but it is not at all unusual to find the worst qualities of iron showing cracks at the end when cut off with the hot set. The appearance of these cracks—not exaggerated in some bad specimens—is shown in Fig. 49. These seams are, of course, due to imperfect union, and are probably often due to the presence of cinder, which has become intermixed with the iron and not expelled during the process of shingling. Sometimes hammering at a welding heat will improve such iron, but if the iron itself is very bad, there is little advantage to be gained by hammering.

Nevertheless, any part that has to be screwed or subjected to great stress or wear should be made as sound and close-grained as possible by consolidation under the hammer or between top and bottom tools at a welding heat. Otherwise the fibres may become partly separated and the metal frayed out, or the open texture of the iron will collect grit and wear rapidly. And after upsetting—an operation that tends to open out the fibres, especially in inferior iron—the metal is hammered at a welding heat, in order to consolidate it.

Every smith who works at the forge is, as a matter of course, well acquainted with the practice, and may think that some of the remarks that are made in these papers are well-nigh needless. Such as may be disposed to view them in this light must remember that I am dealing with theory as well as with practice, and that to beginners in the craft, an elucidation of the why and the wherefore in the various operations of smithing cannot fail to be useful.

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HIVES AND OTHER APIARIAN APPLIANCES.

BY APIS.

THE CYLINDER EXTRACTOR.

VERY many of my readers will, without doubt, wish to attempt a higher flight than the manufacture of the "Little Wonder Extractor" can supply. A Cylinder or Barrel extractor, however, is a piece of work which ought not to be lightly undertaken, and the amateur who turns out a clean and strong job may certainly claim to have passed his novitiate as a tinman.

The same principle governs the action of the Little Wonder and Barrel extractors, the honey leaving the cells of the comb by centrifugal force, but, while in the Little Wonder the entire machine revolves, carrying comb, receptacle for honey, and any honey which has already been extracted, in the Cylinder extractor as few parts as possible are made to revolve: which is a decided advantage. The labour necessary to overcome the inertia of a large mass of material in starting and stopping is saved, and the decreasing weight of the comb, which is perceptible when it and its connections only are revolved, is an indication to the operator that all the honey has been extracted.

Looking at the extractor as a mathematician, many interesting problems present themselves. For a given velocity, the nearer the comb is to the centre of revolution the greater will be the centrifugal force, but the honey in most of the cells will tend to press against their sides as well as leave them. To overcome this tendency the combs should be placed at an infinite distance from the centre of revolution.

It is evident that practice more than theory is what will decide the best position for the combs, and from exhaustive experiments, Mr. Cowan has concluded that the outer surface of the comb should, during extraction, be placed six inches from the centre of the spindle round which it revolves. He has also decided that extractors which hold two combs at the time are preferable to those which hold four or more.

The extractor, then, consists of four distinct features: (1) the frame which holds and carries the comb baskets, (2) the comb baskets, (3) the cylinder, or barrel in which they revolve, and (4) the driving gear, or crank.

I will describe them in this order for a reason which often influences me in my instructions: viz., because the first is most difficult, and at the same time requires least material, so that if a person succeeds in making that, he may hope to bring the whole work to a successful conclusion; while, if he fails, he is not much the worse for the attempt, and the experience gained will probably be worth the bit of tin spoiled.

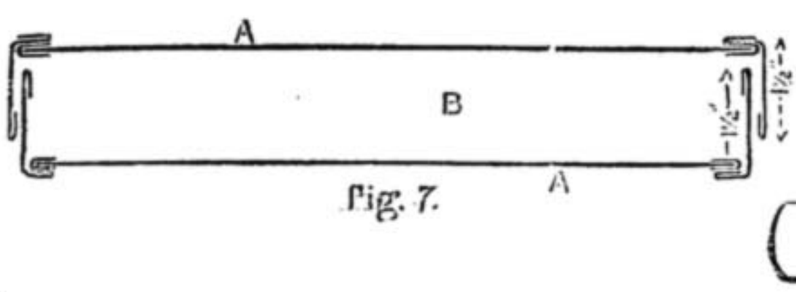

Fig. 7.

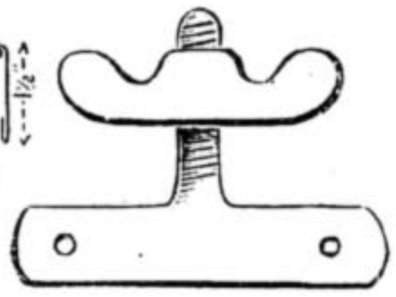

Fig. 10.

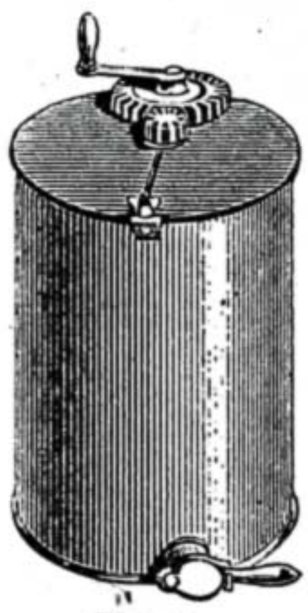

Fig. 1.

Fig. 8.

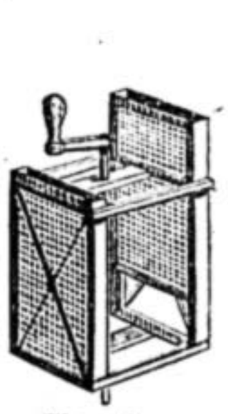

Fig. 9.

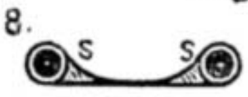

Fig. 2.

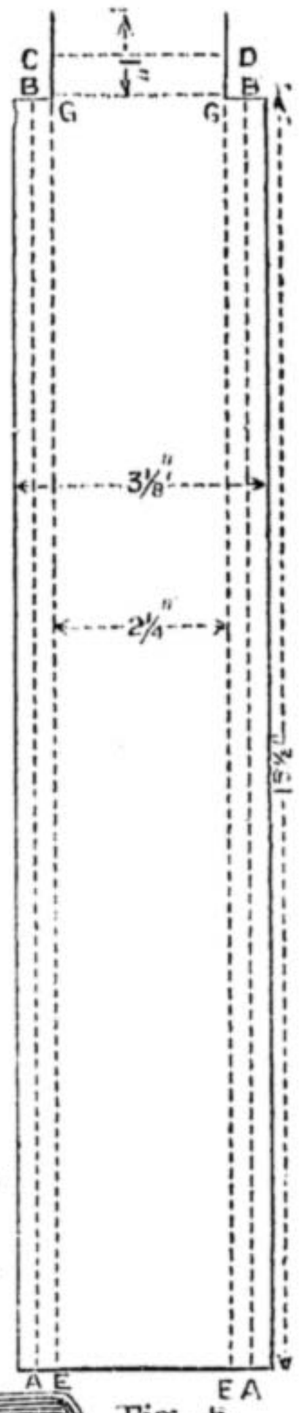

Fig. 5.

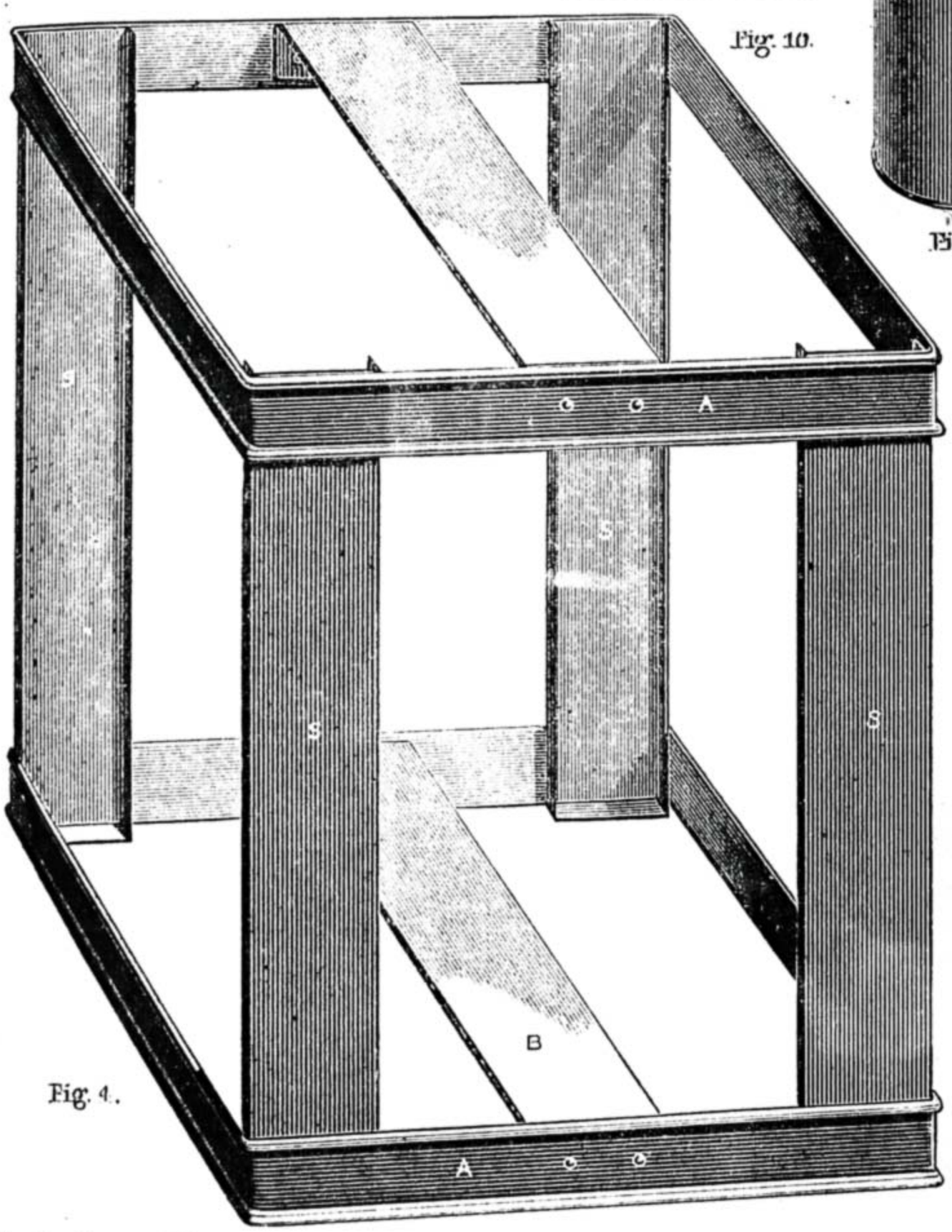

Fig. 4.

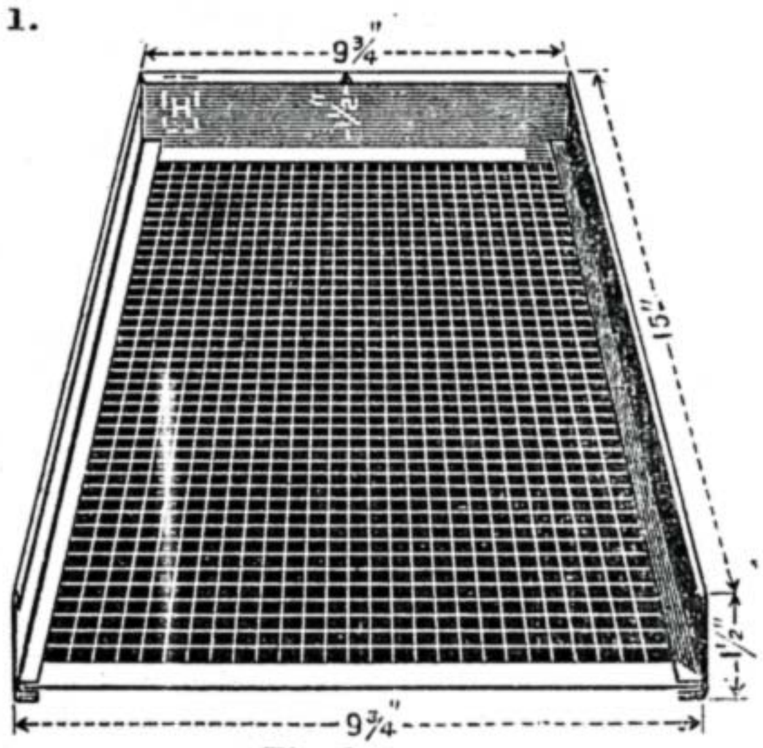

Fig. 6.

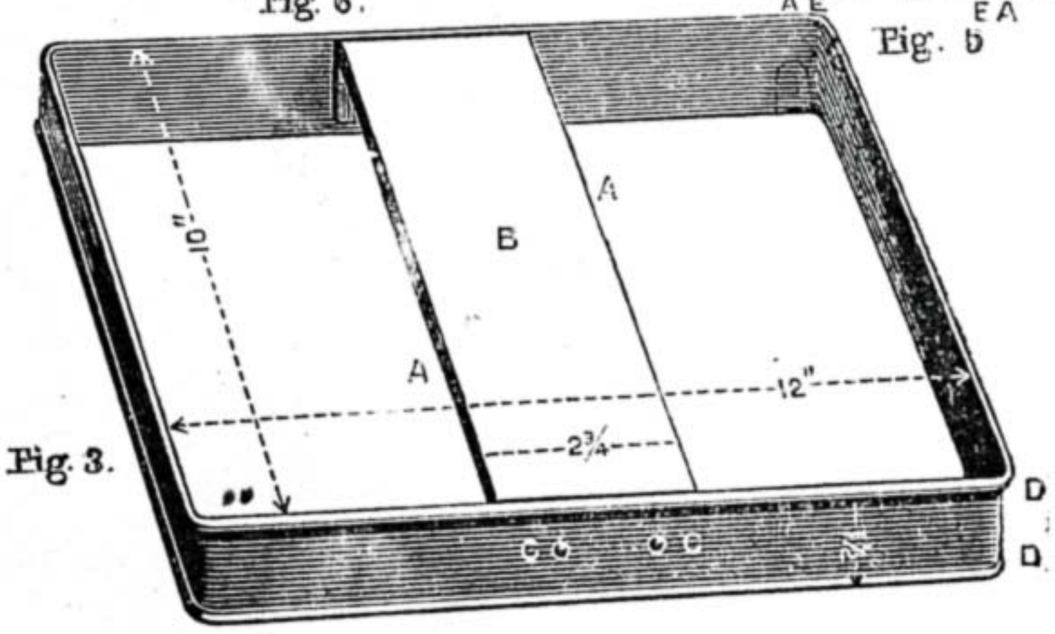

Fig. 3.

Fig. 1.—General View of Extractor. Fig. 2.—Wired Edge soldered to keep out Dirt—S, Solder. Fig. 3.—Rectangular Band and Bridge—A, Wired Edge; B, Bridge; C, Rivets; D, Edge wired all round. Fig. 4.—Bands (A), Slides (S), and Bridges (B). Fig. 5.—Pattern of Slide. Fig. 6.—Half of Comb Basket—H, Hole for Frame End. Fig. 7.—Section through Comb Basket—A, Wire Netting bound round with Tin; B, Space for Comb. Fig. 8.—Extractor showing Baskets in place. Fig. 9.—Frames, Baskets, and Handle. Fig. 10.—Bolt for Cross-bar.

When making my own extractor, I remember inquiring for very large sheets of tin, but could obtain none larger than the Boat tin I referred to in a former article—17 in. by 12½ in. I cannot but feel that if anyone could get tin very much larger in size, or in rolls, like zinc or lead, that many operations connected with tin-plate work would be much facilitated. If any readers could let us know where such could be found, I am sure they would confer a benefit on many others as well as on myself. For the frame forming the first item in our list, three sheets of tin, the size given above, are required. One of the sheets is to be cut

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into strips 2 in. wide, of which it will form six. I may here remark that the edges of tin plates are not always true when they come from the shop; they should therefore be pared until straight. Three strips should be joined together end to end, by turning ¼ in. at the ends over, hooking together, hammering down flat, and touching with solder, as before described. These strips may now be cut to 45 in. in length each, and wired at both edges with wire about ⅛ in. in diameter: No 10 gauge, I think. The wires are to be 44 in. long each. The wiring is effected by turning the edges of the tin over for a distance of nearly ½ in. by means of a mallet and the stake; the wire is then laid along the trough thus formed, and the edge of the tin hammered down so as to entirely envelop it. A good deal of tapping and some practice are required to make a neat bead, but the difficulty is not insurmountable. I may be permitted here to draw the attention of my readers to a plan which I adopted in my own extractor.

I argued that this cage would be a good deal smeared with honey, which would get in between the wire and tin, and there set up fermentation, or be a constant source of dirt. I therefore soldered the tin along outside the wire, so that a nicely formed hollow is made, which can easily be kept clean, and has no corners for dirt (Fig. 2). In this, as in every other part, I used very fine solder, containing a large proportion of tin.

It is best to do all wiring while the tin is yet in the flat, not after it has been bent into shape. This soldering in of the wire to which I referred could be done either before or after the bending into shape, but it is easier to do it before. The inch by which the tin is longer than the wire should not be turned over until a later stage of the work is reached.

These wired strips of tin are now to be bent so as to form two rectangular bands, 12 in. by 10 in.; the inch at the ends which overlap forms a good strong joint when thoroughly soldered. The bending can be done with a wooden vice, such as is usually found in a carpenter's bench, and should be as nearly as possible to a right angle, and the frame or band should not be in winding, but lie flat on the bench; the wired edge would be turned outwards, leaving the inside surfaces flat. If these bands are made to the satisfaction of the amateur, he may proceed with renewed hope to the construction of the rest.

Another sheet of tin must now be taken in hand, and two pieces, 12 in. by 3½ in., cut off across it. These must be wired at both edges, with wires only 10 in. long placed in the middle, leaving an inch at each end free of wire; but the turned over edges of tin may be hammered down flat at the ends. The unwired ends may now be turned up sharp where the wire terminates, thus forming a sort of tin stool 10 in. long, and with legs 1 in. high. These are to be fastened with solder and little rivets to the bands already made. They will, of course, bridge the band the narrow way, which is the only direction in which they will fit, and be equidistant from each short side.

Fig. 3 is a diagram of one of the bands and bridges at its present stage. I need scarcely explain that what I call the bridges are for the purpose of attaching the spindle.

We must now cut four other pieces of tin, 16½ in. by 3⅛ in., and turn over and hammer down ¼ in. slack at each long edge of the entire lot; turn up also ½ in. at one short edge, or end, and hammer down flat; but before any of this turning down is done it would be advisable to take out rectangular pieces at the corners, so as to prevent the tin from being doubled too much. In Fig. 5 I give a pattern of these pieces of tin. The long edges are doubled down along the lines A B, the short one at C D. The long edges are to be then turned up along the line E G, and left standing at right angles to the broad part, and the short end along the line G G, the whole thus forming a kind of trough, open at one end, and having the other end double the height of the sides.

A touch of solder in the corners will bind the edges firmly together, and make the work stronger. The sharp corners of the projecting end should also be nipped off, and rounded nicely with a file.

We are now ready to connect the bands together with these "slides," as I shall call them, as into them the comb baskets slip.

Place one of the bands on the bench with the bridge up, and stand a slide, with the stopped end down, at one of the corners, its back surface being in contact with one of the long sides of the band, and pushed up as tightly as possible towards the corner. A small cramp and a couple of bits of wood can be used to hold the two firmly together, while the square is applied to see that the slide is at right angles to the band. A little solder is then run between the two, and a similar operation performed with the three other slides. The upper band can now be put over the ends of the four vertical slides, and if things have been done carefully, it will be found to fit well, each slide going right into its corner. If, however, things are not true, the square can be applied, and the erring slide or slides found, unsoldered from the lower band, and set right. I put the bridge in, the upper band up also, so that both bridges are turned upwards, and form no troughs to hold the honey, which they might do if turned the other way. Fig. 4 is a diagram of our work at this stage of progress.

Little rivets could be used as well as solder to hold slides and bands together, but they are scarcely necessary; and if used, the heads should not project into the slides, and hinder the baskets from moving freely up and down.

Instead of this framework, a box 10 in. square and 15 in. high could be substituted, having the slides soldered on to two of the sides, while the other two act as backs for the comb baskets. This would be found by many an easier piece of work, and possesses the additional advantage of being easily cleaned, and affording few corners for dirt to lodge in.

I now turn to the comb basket, half of one of which is seen in Fig. 6, drawn from a point near it and between the sides. It will be seen to consist of a bottom of wire netting, two sides of tin 1½ in. high, and one end; the other end is wanting, as it will form the top of the basket when in position. The other half basket is exactly similar to this, but a little narrower, so as to fit inside it, as can be seen in the lower part of Fig. 7.

The width of the outer half of the basket is such as to fit easily between the slides—9¾ in. in mine. The distance between the two nettings can be varied from 1½ in. to more than 2 in., as will be understood from Fig. 7.

To make these baskets, the four pieces of netting should first be procured, cut accurately, two to 15 in. by 9⅝ in., and the remaining two ¼ in. narrower. They should then be bound round with tin which overlaps ⅜ in. at each side. To do this, lay the straight strips of tin, which will be ¾ in. wide, on the bench, and the edges of the netting over them and halfway across. Then solder each wire to the tin, turn the tin over, and solder each wire to the turned-over part also, using plenty of solder and heat, so as to have every wire very firmly held in. By this means the netting is framed in a strong tin frame, which will strengthen it a good deal, and prevent it from sagging. Strips of tin must now be soldered together to form four long pieces 41 in. long by 2¼ in. wide. The edges of these are to be turned over and hammered down to the extent of the usual ¼ in., and one edge turned up at right angles, so that a section of the strips will form an L, one leg of which is 1½ in., and the other ¼ in. Each strip is then to be bent into such a shape as to form the three sides of the half-basket shown in Fig. 6. In two of them the short side is 9¾ in. long, and in the other two ⅛ in. less. To bend the strips it will be necessary to cut the narrow rib with a chisel.

The framed netting can now be laid in position and soldered firmly against the narrow rib, so that there are four thicknesses of tin round the netting.

About ⅝ in. of the sides will project beyond the limits of the netting: this, in the wider pair, should be turned over, and a short bit of wire put in it to afford a hold when drawing out the baskets. In the narrower pair some may be clipped off, and about ¼ in. turned down, so as to have a nice round edge at the top.

To use these baskets, the comb is uncapped at both sides and laid on one half of the basket; the other half is then placed over the first, which it fits, like the lid of a pasteboard box, and the entire basket and comb is slipped down the slides of the extractor, another comb being put into the other basket and slides. The whole is then whirled rapidly until the honey from one side of the comb is extracted; the baskets are then withdrawn, and the other sides of the combs turned outwards and extracted in like manner.

It is unfortunate that a hole must be cut out of the end of each half of the comb basket, so as to let the long top bar of the frames pass through. This could be avoided, however, by making slides and baskets an inch or so longer.

Although it would be better not to make the spindle until we know its exact length—which can only be ascertained when the case is made—yet I can here describe its construction, and leave it afterwards to the ingenuity of my readers. Three classes of spindle may be used; the most workmanlike would probably be ½ in. round iron or steel, tinned all over, or it might be covered with sheet tin soldered on, or it might be a hollow tube of tin: but this I do not recommend. In any case, it passes through the bridges at their middle points, or nearly so, in such a position as to make the cages revolve truly and evenly. The lower end is brought to a long cone, and works in metal bearings soldered to the centre of the bottom of the can. The top of the spindle takes either a cranked handle or a toothed pinion, with which it is driven. The tops of the cages should be a couple of inches lower than the top of the can.

It will be necessary to put tin washers in the bridges to strengthen the hold of the

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spindle. They could be 1½ in. diameter, beaten saucer-shaped, with a hole in the middle, through which the spindle passes. After it has been soldered to the bridges these washers could be placed over the point, and attached both to the spindle and bridges. It would be well to have the holes a little small, and to turn out the edges until the spindle can pass through. This will give a firmer hold to the solder than the mere thickness of the tin could afford.

For the cylinder itself we will require a sheet of tin, or rather tinned iron, 55 in. by 26 in.; the top and bottom should be wired with ¼ in. wire, and the edges turned over to form a joint. The sheet is then to be bent into a cylinder, and the joint made and soldered.

A piece is next to be cut out for the bottom, and the edge turned up a quarter of an inch all round. The bottom, however, should be slightly, say ½ in., larger than the diameter of the cylinder, as it is to be placed in it in a sloping position, so as to allow all the honey to drain out of the cylinder through a treacle valve, which is placed in the lowest position. The flange of the bottom will be turned down, and firmly soldered to the sides of the barrel. The centre of the bottom being ascertained, a bearing for the lower end of the spindle can be soldered in place either before or after the bottom has been fixed; the under surface of the bearing is to be filed to an angle to suit the bottom, so that its top surface is horizontal. A couple of bands of hoop iron, ⅛ in. thick and 1¼ in. wide, riveted to the edges under the bead, strengthen the cylinder a good deal. To the top one I attach the bolts (Fig. 10), which hold the bar forming the top bearing for the spindle, one of the bolts breaking the joint of the hoop. Fly nuts or hexagonal nuts do nicely to fasten the bar with. This bar is 1¼ in. by ⅜ in.—long enough to reach across—with holes drilled for bolts, and one for spindle to pass through. A plain short crank handle I recommend for driving, as being the simplest and, what is equally important, the cheapest.

Fig. 8 shows the extractor complete with the frame inside, and Fig. 9 shows framework and baskets. The two wires shown crossing each other in this figure should receive attention. They are to prevent the network from bulging, and are ⅛ in. thick, fastened with solder to the framework at their ends, and to each other in the middle. The outer wire should be bent at the point of juncture, so as to be flat against the network; otherwise, it would be of very little use.

If it is decided to use gearing, wheels like Fig. 1 can be got from Richard Lloyd, Steelhouse Lane, Birmingham. The pinion will fit and be keyed to the spindle, and the wheel will work on a stud riveted to the cross-bar. The cross-bar would, in this case, require to be somewhat stronger—say, ¼ in. thick.

The extractor is finished by the addition of a couple of handles riveted to the sides, and covers, of which there are two, one at each side of the cross-bar. It is far easier to have the covers flat, in which case the edges can be turned down, and made to embrace the rim which fits into the barrel. A careful study of an ordinary saucepan cover will show how this can be done. The treacle valve can be got from most dealers in hive furniture, and will cost about 2s.

I will conclude this paper with the warning with which I began: that is, not to embark on such an adventure as making a cylinder extractor without having had previous experience in tin-plate work. It would be far better to be content with the simple Little Wonder than to waste time and material on a fruitless attempt to improve on it.

FITTING AN ELLIPTIC CHUCK.

BY JAMES LUKIN.

INSIDE SCREW FOR MANDREL—SLIDING PLATE—PALLETS—SLOTS.

THE inside screw for the mandrel must be cut before the work is removed from the face plate. A tap is first used centred on the point of the back poppet after a spanner has been fitted to its squared end, and a true entrance given by slightly bevelling the outer edge of the hole. This tap is only required to cut a pitch line of slight depth to give a true start to the chaser which is to follow it. It ought, properly, to be made for this special work, being a tap with sharp threads like the plug-tap, but of smaller size, and slightly taper. An ordinary entrance tap, having no sharp thread at the end, is not fit for the purpose; and if one of an ordinary set has to be used, the intermediate one will be the most suitable. All lathes should, however, be fitted with a proper chuck tap, as it is so frequently needed even for boxwood chucks. Little by little it is to be screwed in, the back centre being constantly advanced to keep it true, and when at the bottom of the hole it must be as gently unscrewed, the back centre being also gradually withdrawn. A hand chaser will readily follow the lead given by the tap, and deepen the thread to the extent required, after which a plug tap, the exact size of the nose of the mandrel, will bring the thread up sharp and clean to its full size. In most lathes there is a smooth cylindrical bit of mandrel beyond the thread, which greatly aids the true fitting of chucks; and, therefore, a few threads have to be cut away, so that the chuck may itself rest on this cylindrical bearing, and bed up true and close against the shoulder of the mandrel. When this part is ready, the face plate must be removed, and, without detaching the chuck, it must be carefully and gently screwed on the mandrel. It ought to fit perfectly, and if it does not go quite home, it must again be unscrewed, and the necessary alterations made. It is open to all to make it a *good* fit, and not a *loose* one. If all proves correct, the chuck can be taken off the face plate and screwed on its mandrel, for the purpose of levelling the face which is to receive the guide bars. This is simply a matter of brass turning with the slide rest, and should present no great difficulty. Light cuts with a round or point tool will soon reduce the surface to an accurate level. A planisher, which is practically a chisel or flat tool for brass, the edge of which is formed as a wide curve, will put a good finish upon this part, and leave it dead level.

For this chuck, however, it would be no detriment if the sliding plate did not take a bearing on the surface of the lower one; the double chamfered bars will, in fact, slightly lift it. But if there is any *convexity* it would be fatal to the work. As it will be as well to complete the turning operations before taking up the file, the top plate will be the next piece to attack, and as we are supposing its boss cast on, we have a capital means of chucking it. But it will be the better plan, first of all, to true up this boss a little, as very often it has lumps and excrescences about its base, which should be removed by a chipping chisel as a preliminary operation. The lower or flat face may also be gone over with chisel and file to reduce any prominent spots upon its surface; after which it is to be clamped on the face plate, and the boss adjusted to run as true as possible, especially if, as often happens, it is not much above what will be its finished size. The exposed side and the boss may now be gone over as before till fairly true, and the boss turned cylindrical. It need not, however, be finished at this stage, the object being to enable it to be held in a self-centring chuck while the rest of this face rests fairly against the outer part, or surface, of the largest jaws of such chuck; or, if no such appliance is at hand, the boss may be held in a large chuck of wood, specially prepared to provide also a good surface for the support of the plate. This will prevent springing during the operation of turning. If there is no back gear to the lathe, it will be necessary to use the slowest speed attainable without it, which will often be sufficiently slow for brass and gun-metal. Thus mounted by the boss, the under side of the sliding plate is to be fixed as accurately as possible, and finished, as the foundation plate was, with a planisher. When this is done, and the whole is remounted on a face plate, it will lie perfectly flat and even, but the boss and the upper surface will probably have become untrue, for which reason they were left in an unfinished condition. They are now to be entirely finished, and the screw traced, but the latter may still be left a trifle too large, that the final touch may be given to it after the chuck is put together. This nose-screw, of course, will present difficulty if the lathe has no traversing mandrel; and unless the amateur is a fairly good hand with a chaser, he should get it cut for him, or get someone with stock and dies to trace the threads sufficiently for the chasing tool to take a decided and accurate lead. I may, however, state here that the American mode of making oval and other chucks, independently of the lathe on which they are to be used, may be followed out in these home manufactures. These chucks fit upon an ordinary flange chuck, which the lathe maker will always supply to fit the mandrel. It is then only necessary to true up the face of this flange, and to fit it nicely to the recess on the back of the bought chuck, and when the screws are put in—which are supplied with the chuck, and tapped on to it—the whole will be found to run true. In making an oval chuck, therefore, the back plate may be arranged to have a recess turned out into which a flange chuck can be fitted, and attached by three or four screws. This will save all the *first* screw cutting described, although it will not bring about escape from having to cut a thread upon the chuck nose, to receive the ordinary cup and other chucks of the lathe.

Having done all this work, we have now to attack those parts which must be finished by tools other than the lathe. These are the guide bars and the grooves on the edges of the sliding plate. Taking the bars first, they are to be filed up true and square. A centre line is then to be made by scribing block or gauge, which line will show better if the bar is chalked; and it will then be as well to go over it with a sharp pointed dotting punch, so as to secure it from

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obliteration during the process of filing. This line is to be accurately central. as it will become the sharp edge of the double chamfer. A line must now be also marked on each side of the bar, at a distance from its edge rather less than the thickness — $\frac{7}{8}$ of such thickness will be sufficiently near to produce a double bevel, the section of which will be an equilateral triangle. This is not actually the best angle, but it will facilitate operations to use it, because a three-square file will then exactly make the grooves in the slide. If appliances are at hand in the shape of a planer or a revolving mill, these grooves may be advantageously worked deeper, and, consequently, to a smaller angle, but the dimensions given will answer very well; and if the work is carefully done, the action of the slide will be quite true and steady. Having marked the above lines, add two more about $\frac{1}{32}$ beyond them, merely as a precautionary measure, so that if, in the act of filing up to the lines first scribed, any part should get effaced, the second lines will be a guide to parallelism. All that remains is carefully to file the two flats until the guide lines are just reached, but not obliterated. It is, of course, a matter of skill as well as care, because filing does not come by nature any more than reading and writing. At this stage no attempt at *finish* should be made, accuracy alone being aimed at. The holes for the holding-down screws may now be drilled, and the bars thus far fitted may be laid aside. The grooves in the sliding plate will now call for attention, and a central line must be marked accordingly with a scribing block or gauge. An ordinary plated carpenter's gauge will answer very well, set to mark the exact centre of the bar. This line may now be dotted pretty deeply with the punch, or gone over very carefully with a graver until it is well defined and fairly marked by a decided groove. Having purposely experimented, I have decided that the best tool to use for deepening the groove is a Lancashire three-square file, which is not bellied as a Sheffield saw-file is, but is quite parallel. Use a fairly large one, say, a six-inch, and grind off the end quite square, which will give three sharp cutting angles, and the tool will then be found in every respect suitable for the work in hand. Working partly with the sharpened end, and partly with the sides, the latter being used to finish, very little difficulty will be found in making the equilateral grooves, which will have an angle at the apex identical with that of the guide bars. The finishing touches will be given at a later period.

At this point we are now supposed to have the bars shaped and drilled for their screws, and both the foundation plate and slide levelled and roughly finished. Lay the former plate upon the bench, or upon the lathe bed, which latter will allow the boss to lie in the space between the bearers, and give a true and solid bearing to the plate; or screw the boss (protected by sheet-lead) in the jaws of the vice, and lay the slide upon it, gauging with great care, so as to ensure the centrality of its position. Bring up the bars on each side after this has been done, and press them into their respective grooves. Now take a punch that should fit fairly well the drilled holes of the bars, and placing it in these holes, mark in succession the places for the screws, and proceed at once to drill and tap them. It will facilitate matters, by preventing slipping, if a couple of light screw clamps are used to hold the slide in its central position, while the guide bars are placed and the holes marked, but the main point is to do nothing in a haphazard fashion. Mark gauge lines on the plates; take measurements right and left from a fundamental central line; file up to your lines, but so as not to obliterate them, and consider well and carefully before cutting, filing, or drilling, and there need be little fear of failure. Our work, however, is by no means yet completed. The pallets, by which the slide is actuated, have to be made and fitted, and slots arranged in the back plate to allow them free action. These slots will, in all probability, have been made in the casting; but if not, a row of holes must be drilled, and with file and chisel they must be thrown into one, and the slot squared up to truth.

The slots will be about $1\frac{1}{4}$ in. by $\frac{1}{2}$ in. in width. They must be exactly in the middle of the plate, like A, B, Fig. 5, and should be gauged from a central line C D. They also need to be filed out squarely in each direction. The pallets are shown in Fig. 6, A and B. They are of steel, the plate $1\frac{1}{4}$ in. in length and $\frac{1}{8}$ in. thick, the bottom part being extended to form a square tenon. This tenon works freely, but without shake, in the slots of the back plate, and also fits a much shorter, but similar, slot in the slide, to which it is secured by a washer and screw. The reason of the slot in the slide, instead of a square hole to fit the tenon, is the necessity there is for some slight adjustment lengthwise of the plate, in order to make the pallets just grasp the ring that is fixed to the poppet, and thus also ensure the normal centrality of the slide. To aid in this adjustment, there should be a screw tapped into each end of the slide, and long enough to act against the tenon of the pallet, which is thus secured from slipping outwards. It cannot, of course, slip in the other direction, as it is resting against the ring itself.

In Fig. 7 is a view, in part sectional, of the sliding plate, where A is the plate, B, B the pallets, showing their tenons and the small adjusting screw by which their position is regulated In the small space on the opposite side to that of the screw a small packing piece of brass may be inserted when the adjustment of the parts is complete, as it will rarely require alteration, and the motion of the chuck is so slow, comparatively, when in use, that the wear of pallets or of the ring is very trifling. There is nothing in respect of fitting the pallets other than careful filing, so as to make the flat faces accurately square across the face of the slide when in position. A steel set square, frequently used to test the work as it proceeds, will ensure the requisite truth, provided always that the workman can use a file skilfully. This must be premised in the case of an attempt to make a chuck, of which all parts need accurate workmanship.

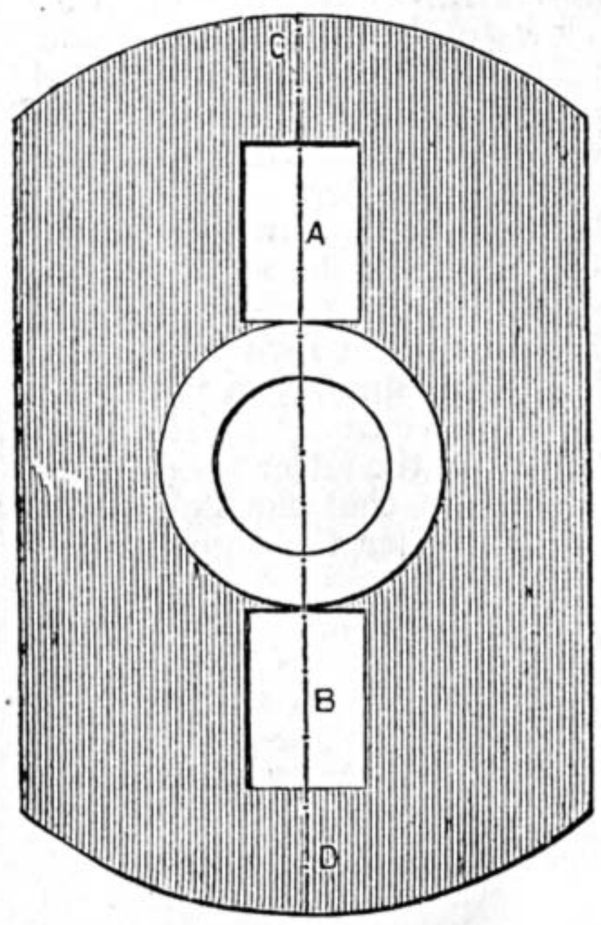

Fig. 5. — Back Plate, showing Slots for Pallets — A, B, Slots; C D, Central Line.

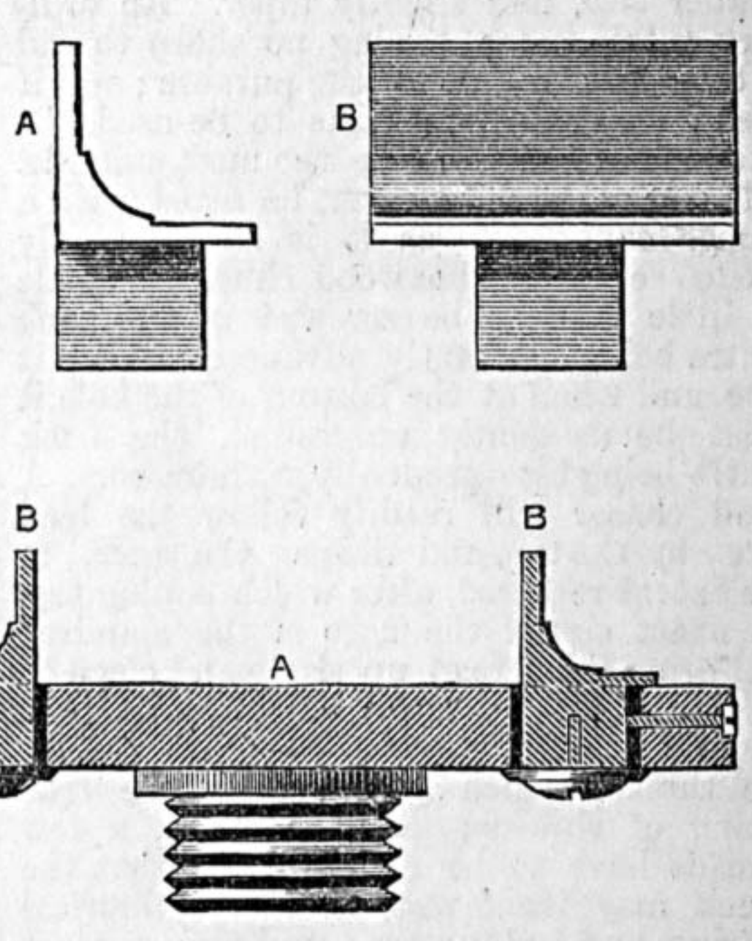

Fig. 7.—Sectional View of Sliding Plate—A, Plate; B, Pallets, showing Tenons and Small Adjusting Screw.

Fig. 6. — Pallets — A, Side View; B. Front View.

SHEET METAL WORK.

BY R. ALEXANDER.

TINMEN'S MOUNTINGS OR FURNITURE ILLUSTRATED AND DESCRIBED — REPAIRING HANDLES TO TEA AND COFFEE POTS — STRAINERS TO TIN AND METAL TEAPOTS — THE SAUCEPAN — PATTERN OF SAUCEPAN, AND HOW TO CUT AND MAKE UP.

IN many repairs, as well as in the making-up of new goods, fittings and parts are frequently required that are not in the province of the tinsmith to make himself. These are termed mountings or furniture, and comprise such things as wrought-iron handles for kettles, saucepans, slices, etc., and handles and ears for fish and camp kettles, wooden handles for tea and coffee pots, metal knobs, etc. etc. Subjoined are illustrations of most of the mountings required for ordinary use. They can be obtained of Messrs. Hopkins & Sons, Granville Works, Birmingham; T. P. Lomax, 155, Moor Street, Birmingham: Perry, Son and Co, Temple Street Works, Wolverhampton; and others; and retail of most large ironmongers. It is best to buy from a wholesale house, as the difference in price is very considerable. Prices I have not given, as there are so many sizes and varieties, but the above-named firms will quote prices on application. The fitting of most of these mountings to articles requiring them does not call for special remarks. Coffee pots, when new handles are fitted, should be placed on a tool, and the handle driven into the socket fairly tight with a mallet, taking care not to burst the socket; a hole punched in the socket with a bradawl, and a tack driven in, and the head soldered over to prevent its coming out again. In putting new ears on fish kettles and other things with bail handles, the ear had better be slipped on the hook of the bail before it

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Fig. 28.—Body Handle.

Fig. 29.—Boss.

Fig. 31.—Notch Pattern.

Fig. 30.—Apron.

*** For Inscriptions of Cuts not given here, see End of Article.*

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1.

Fig. 5.

Fig. 8.

Fig. 6.

Fig. 7.

Fig. 9.

Fig. 11.

Fig. 10.

Fig. 13.

Fig. 15.

Fig. 14.

Fig. 19.

Fig. 18.

Fig. 12.

Fig. 16.

Fig. 17.

Fig. 34

Fig. 27.

Fig. 20

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25

Fig. 26.

Fig. 36.—Section of Body folded.

Fig. 37.—Section of Grooved Seam.

Fig. 32.—Handle of Cover.

Fig. 35.—Example of "Tying."

Fig. 33.—Flat Pattern of Body of Tin Saucepan (half full size).

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is riveted to the article, as, if the hook of the bail turns up much, it will be a job to get it into the ear after it is riveted.

Repairing tin teapots with iron handles: When the handles have come out of their sockets, which is a very frequent occurrence, the tin sockets must first be melted or unsoldered from the teapot, the wrought-iron tangs of the handle filed bright and tinned, the sockets fitted on the handle, and the tangs well soldered to same, then re-solder the sockets to the teapot. It is strange to see the cobble some people make of this simple job, soldering the cast-iron part of the handle, without removing the sockets and putting little straps round, and soldering them to the teapot. Whether it is from not knowing any better, or with the idea of saving time, I cannot say; but the right way, which is the one I have described, is the quickest and best. See that the seam under the sockets is sound before replacing them, as the unsoldering sometimes makes the seam leak, as they are not soldered very strongly when first made.

New Strainer to Teapot.—This is sometimes an awkward little job for a novice, more especially when the teapot is of the common sort, with stamped neck on top of a small lid. The best way to manage it is to cut a piece of tin the required width, long enough to go from top to bottom, punch a diamond-shaped pattern in it (Fig. 27), bend it to a slight curve, place it in position in the teapot, and mark round it with a scriber, scrape the teapot, replace the strainer, and tack in several places; there is no need to solder all over. When putting new bottoms to these teapots, always look to the strainer then, as it is easy to get at; the newer pattern pots, with straight, tapering sides and no necks, are easier to do, as the opening is much larger.

Metal teapots fortunately do not often require new strainers; they need great care, and are sometimes very awkward to get at. I have had some that it was quite impossible to do from the top, owing to their peculiar shape and smallness of opening; but they had to be done, and the only plan was to cut out the bottom and solder in the strainer from that opening, and replace the bottom afterwards—a rather troublesome job, but the only way out of the difficulty.

I am of opinion that, with the instructions given up to the present, most ordinary repairs will be understood. I might multiply examples by the score, without any additional benefit. There are, of course, other repairing jobs that need explanation, but they will be easier understood after some lessons in the method of working up new goods; in the meantime, however, any special job I shall be pleased to advise upon in "Shop."

New Work.—We will now proceed to the subject of new work. I may state here that it is not my intention, nor would it be advisable or even necessary, to describe all the multifarious articles in the trade; but to select what I will call types, by the study of which the workman will be able to understand the making of things of similar shape and use. I propose to commence by describing articles of a cylindrical form, and will take, as a subject to illustrate a class, that most useful of articles, the saucepan.

Saucepan.—Let us take for an example of this kind of work, a two-quart saucepan (Fig. 34). This, when made up, is about 6 in. diameter and the same in depth. Its flat patterns are shown (Figs. 28 to 33). They consist of body, handle, boss, apron, and cover handle; the bottom and cover do not require patterns, as they are struck out with the compasses; the rim of the cover also is marked out by means of a home-made article called a flue rim. Referring to the body pattern, it will be noticed that each corner is notched; the notches at the top (of which the full size is given in Fig. 31) are for the seam and wire, and are cut longer one way than the other, because the fold for the wire requires to be much more than the fold for the seam; the notches at the bottom are so that there shall not be four thicknesses of stuff after the seams are put together.

Marking and Cutting Out.—Let me point out that the body will be in two pieces if cut out of single plates, and in one piece if cut out of 20 in. plates. I shall suppose single plates to be used, for the sake of the example of grooving two pieces together. It will be seen, on laying the pattern on the plate, that two pieces can be got out of each sheet, with a narrow piece left at the top, which will do for the rim—thus one plate will cut the body and rim. The cover, bottom, and small work will be marked out when required. When a quantity is made at a time, it is best to cut out with the stock shears, as two or three sheets can be cut out at one time. When this is done, only the top one of each lot need be marked. To keep the plates from shifting, the tin is cut in convenient places and twisted over and hammered down, forming what are called "ties." Fig. 35 shows an example of this. To cut this circle out you would commence at A, the ties then hold it till you get right round; it will be easily seen that if the cut commenced at B the ties would be cut off before the circle was completed. Great care must be taken to get all straight lines quite true, or, if the folding machine is used to fold the edges, you will soon find it out. Having cut the bodies out, the next thing is to pass them through the rollers, to break the "grain" of the stuff. Take six pieces at a time, and setting the front roller so as not to pinch the stuff, pass them through, setting the back roller down till the pieces roll out a semi-circle; turn them over, place in the rollers again, bend the stuff down so as to allow it to catch under, pass them through once more; turn over again, and place between the front rollers, raise the back roller two or three turns and pass through, and the stuff will come out straight. The reason for doing this is because if it was not done the bodies would, when wired and turned round, present a ribbed appearance, which looks very bad: where there are no rollers it is done on the former, or across the workman's knee; the latter plan is not a wise one, as the "burr" of the tin is apt to cut the apron or trousers. The next operation is folding the bodies for seaming and wiring. Place the body pieces on the left of the folding machine with the top notches *from* you; this is important when the articles are to be what is called lap-wired, which is the most workmanlike way of wiring this kind of article. Set the machine to a small fold—a trifle over $\frac{1}{8}$ will do very well; too large a fold makes an ugly seam. Raise the front roller of the machine by means of the two screws; this will give a close, flat fold; place a piece in, press it close to the guide-plate, raise the handle of the machine, keep the tin in its place with the left hand, let it come up as far as it will, and then lower it on to the bench again, and the folded piece will slip out easily. The other end must be folded on the opposite side (Fig. 36), or the pieces will not come right when you go to seam them. When all are done, the pieces must be folded for wiring; No. 11 or 10 will be the size wire to use. Set a pair of compasses to twice the size of the wire, mark a line on the tin that distance from the edge, and set the machine till it just allows the line to disappear; lower the front roller to give a rounding fold this time. Raise the handle only half the distance this time, as the fold does not require to be brought over so far for wiring. This completes the folding. Should, as is very likely, any slip out of the machine, either when folding for the seams or for wiring, they must be finished on the hatchet stake; and should there be no folding machine, the whole of the folding must be done on that tool. In that case, in folding the seams the notches must be kept *towards* you.

The number of illustrations leaves no room for the insertion of all the inscriptions on the same page, so those that do not appear are given here:—Fig 1.—Steamer and Colander Handle. Fig. 2.—Chamberpail Bail and Ears. Fig. 3.—Fish Kettle End Handle. Fig. 4.—Tea-kettle Handle. Fig. 5.—Barrel Handle. Fig. 6.—Common Tea-kettle Spout. Fig. 7.—Best Tea-kettle Spout. Fig. 8.—Stamped Teapot Spout. Fig. 9.—Coffee-pot Socket. Fig. 10.—Saucepan Handle, Flat. Fig. 11.—Saucepan Handle, Barrel on Socket. Fig. 12.—Slice or Ladle Handle. Fig. 13.—Fish-kettle Bail. Fig. 14.—Iron Teapot Handle. Fig. 15.—Coffee-pot Handle. Fig. 16.—Gravy Strainer Handle. Fig. 17.—Dustpan Handle. Fig. 18.—Wood Teapot Handle. Fig. 19.—Wood Coffee-pot Handle. Figs. 20, 21, 22, 23.—Various Metal Knobs. Fig. 24.—Dish-cover Handle. Fig. 25.—Gravy Strainer Bottom. Fig. 26.—Coffee Percolator Bottom. Fig. 27.—Teapot Strainer and Tacks. Figs. 28, 29, 30, 31.—Small work of Two-quart Saucepan, as specified, with Figs. full size. Figs. 32, 33.—See Illustrations. Fig. 34.—Tin Saucepan. Figs. 35. 36, 37.—See Illustrations.

OUR GUIDE TO GOOD THINGS.

**** Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

73.—THE TIMBER MERCHANT AND BUILDER'S VADE MECUM.

THIS is the fifth edition of a valuable work by Mr. George Bousfield, published at 4s. by Messrs. William Rider & Son. 14, Bartholomew Close, London, E.C. It deals in a comprehensive manner with every kind of measurement required and practised in the timber trade, and several new tables, problems, and rules, peculiar to the requirements of the trade, have been added, with a brief treatise on the slide rule. Much useful information will be found by the reader on the various kinds of foreign and home-grown timber, mouldings, and terms used in building.

74.—ALUMINIUM: ITS USES AND ALLOYS.

Let me take this opportunity of telling the readers of WORK that any information they may require respecting aluminium can be obtained from the Alliance Aluminium Company, Limited, 7, Great Winchester Street, London, E.C., who issue, and, I presume, supply, to intending purchasers an exhaustive pamphlet on aluminium, its qualities, and the method of working it, named as above. The Company produce and supply four qualities of metal, distinguished

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as A A, A, B, and C. The first quality has a guaranteed purity of 98½ to 99½ per cent., the impurities making up the hundred parts consisting of iron and silicon only. This is sold at 20s. per lb., or 1s. 3d. per oz., and is particularly recommended when almost absolute purity and great softness are required. The least pure quality C contains only from 90 to 95 per cent. of iron and silicon, and is sold at 11s. per lb. For orders of 2 cwts. and over these prices are considerably reduced. THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

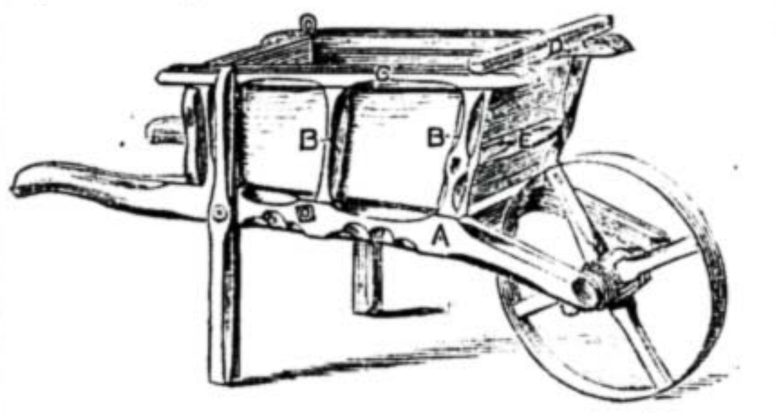
NOTICE TO CORRESPONDENTS.

*** In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

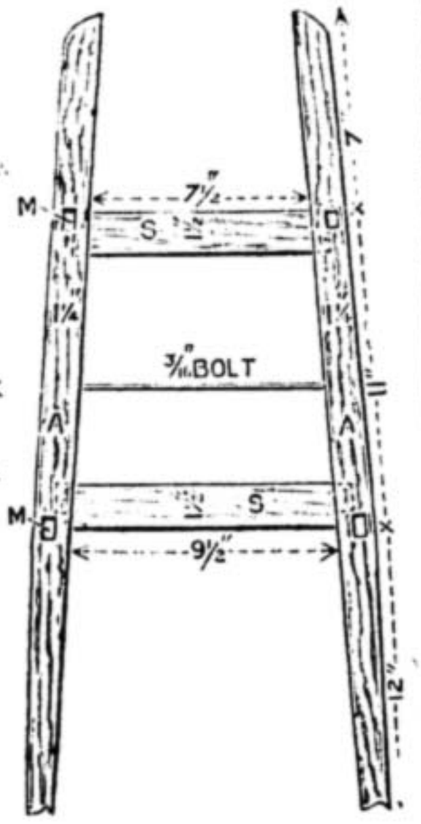
Child's Barrow.—H. J. A. (*West Hougham*) writes:—"I enclose a rough sketch of a child's barrow; if it is not plain enough, I will try to help you further if I can. It will look very well if you spend a little time and trouble in making it, and paint it a showy colour. The size of the stuff required is appended below:



It will do for a child from the age of 4 years till it is 7 years.

SIZE OF STUFF FOR BARROW.

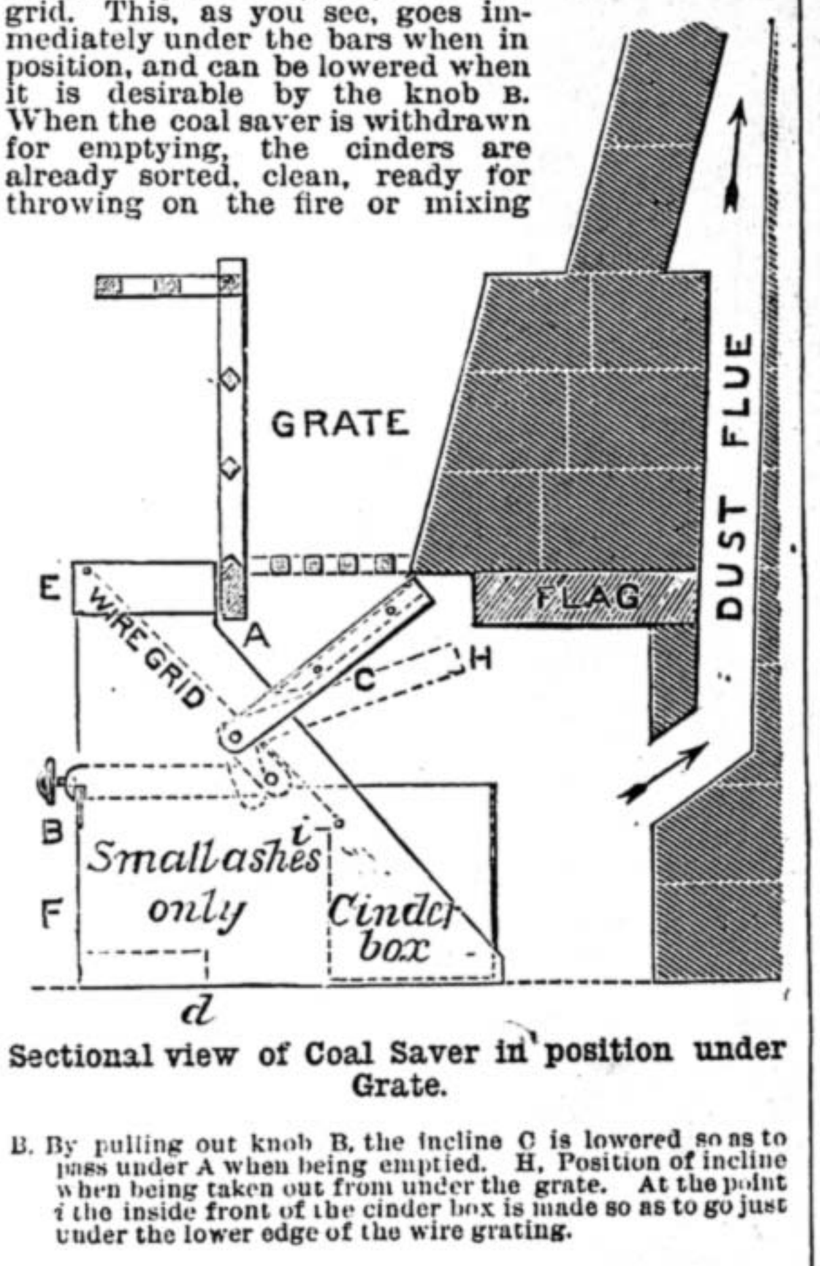
	in. deep.	in. wide.
Shafts (A)	1½	1½
Cross Pieces (S)	1½	1½
Standards (B) ..	¾	1
Top Rails (C) ..	1	¾
Front Rail (D) ..	1½	1
Bar for front (E)	1	¼
Legs	1½	1½
Boards for sides	¼ thick	
Boards for bottom	⅜	"
Bolts	⅜	"
Wheel	10 high	



Child's Barrow and Parts.

Circular Saw Teeth.—A. R. (*Scorrier*) writes:—"I would like to call the attention of the readers of WORK to Figs. 1 and 2, on page 403, No. 77, where it reads, 'the length, space, and rake of teeth. Figs. 1 and 2 I have proved to answer well.' It should have been stated how much the teeth had been reduced to those in sketch sent with letter. The length of teeth, Fig. 1, should be 1¼ in., and space from point 2¼ in.; and in Fig. 2, length of teeth 1 in., and space from point to point 2 in."

A Coal Saver.—J. W. B. (*Southport*) writes:—"Enclosed is a sketch of a coal saver of my own construction, and has been in actual use now for nearly two years. It has saved *tons of coal* and *clouds of dust*. I should have patented it only for one reason. Kitchen grates are not all of the same construction as to size of opening underneath, and the 'saver' could not be made for stock. It is a most useful article for a kitchen. Amongst its many advantages are: it keeps the hearth always tidy, as the rakings from the front always fall into it. The grid (wire) is fixed at an angle that ensures everything rolling either down or through, and so altogether out of sight. There is an inclined portion underneath the bottom of the grate which directs any cinders, etc., on to the grid. This, as you see, goes immediately under the bars when in position, and can be lowered when it is desirable by the knob B. When the coal saver is withdrawn for emptying, the cinders are already sorted, clean, ready for throwing on the fire or mixing



Sectional view of Coal Saver in position under Grate.

B. By pulling out knob B, the incline C is lowered so as to pass under A when being emptied. H. Position of incline when being taken out from under the grate. At the point i the inside front of the cinder box is made so as to go just under the lower edge of the wire grating.

with small coals. The cinder box can be lifted out. There is nothing amongst the ashes which can possibly be burnt, and it is simply a matter of carrying it to the dust-heap. When the cinder box has been removed there is no obstruction. It is merely a matter of tilting it up. Every cinder is collected, and that without trouble. The remainder is removed without the usual dust from sorting on the hearth. It is much better than a grid, because that has to be emptied at times. The top portion E is brass, plain. There are three brass knobs in front; the one on drawing being the centre one. A brass moulding might be put on the bottom round the front to point D. It would smarten it a little. It does not in the least interfere with the draught. Just about the point F I had some perforations, but they are not necessary."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Cement to resist Action of Carbon Bisulphide.—F. D. (*Dartmouth*).—The following cement has been kindly recommended by a friend who has had some experience in such matters. Soak some pieces of best glue in water until they are soft and swollen, then drain off all the water and make the glue into a cement by adding enough glacial acetic acid to thoroughly dissolve the glue. Then add a slight trace of strong solution of bichromate of potash, and stir all well together. This will resist the action of carbon bisulphide.—G. E. B.

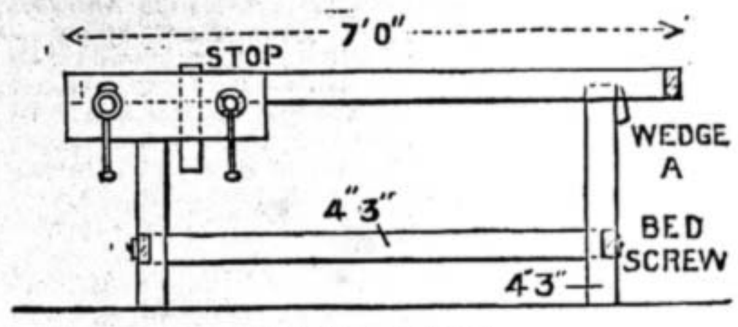
Softening Plaster Cement.—F. A. (*Peckham*).—Try soaking the silver mounts in a mixture of equal parts muriatic acid and water made warm in a porcelain or stoneware vessel. This should soften the plaster, and will not injure the silver or the glass. Be sure not to try this on zinc, tin, or brass mounts coated with silver, or on nickel-plated mounts. On plated mounts try a strong warm solution of potassium cyanide. I have known this to loosen mounts when I have not wanted them loosened.—G. E. B.

Engine.—SIDE LEVER.—Perhaps one of the makers will supply you with a set of drawings for a guinea or two, provided you are not a rival in trade. If they will not, make friends with an intelligent engineer, and get rough sketches from him, or permission to make sketches yourself.—J.

Pump Castings.—AMATEUR.—Any of the model makers supply these. Stiffin, 324, Essex Road, N; Lee, High Holborn; Bateman, High Holborn; Lucas & Dane, Hatton Garden.—J.

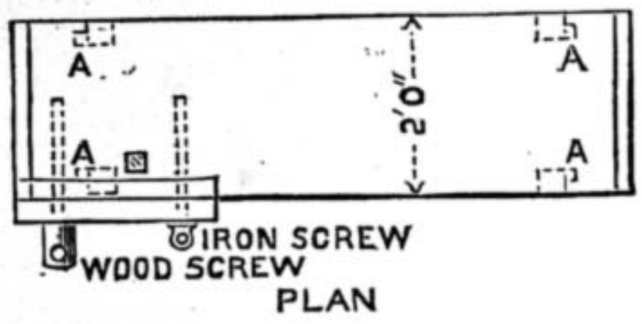
Battlesden Cart.—G. H. (*Camberwell*).—An article on the above appeared in WORK, No. 19.

Carpenter's Bench.—J. B. F. (*Brixton*).—The accompanying sketches show the elevation, plan, and end view of a bench which you will find give much more satisfaction than an ordinary joiner's bench, especially for home use. I have worked for years on one, and would not use the other



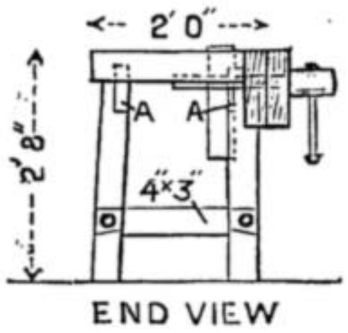
ELEVATION

pattern under any consideration if I could help it. The top is made of 4 in. beech, clamped at each end with a piece 1½ in. by 4 in. simply nailed on. The screw cheeks are of beech and the rest yellow deal. The legs are simply mortised into



PLAN

the top and fastened with hard wood wedges driven tightly in, as at A. The long rails are stubbed into the legs about ½ in., and the short rails halved on, and four 6 in. bed screws hold the whole together. This method makes it very portable. I have two screws to mine, as shown, and most people will tell you that this makes it a cabinet-maker's bench; but, if you once get used to two screws, I feel sure you will never want to work with one, unless you have one of the patent iron screws and cheek. There are several very nice patterns of benches that can be bought from £1 upwards; the one I have described can be bought for about 30s., made entirely of beech.—E. D.



END VIEW

Banjo Vellum.—J. K. (*Manchester*).—Brass wire is used for the edge of the vellum. To put on a vellum, get a vellum 2 in. larger than diameter of hoop; if your hoop is 12 in., you must use a 14 in. vellum. With a bradawl make a series of holes round the edge of vellum, keeping them about ¼ in. from the extreme edge and say about 1½ in. apart. Take a piece of string a banjo 2nd or 3rd string is the best, and long enough to go right round the edge of vellum—and thread it through the holes, taking care that both ends of the string come out on the under side of the vellum. Put the vellum in water to make it pliable, but do not let it stop in too long, say about one minute (some vellums are liable to tear if made too wet), let the water drain off, lay the vellum on hoop, put on the brass wire ring, pull the ends of string, turning up edge of vellum all round, pull the string tight so that the edge of vellum lays well over, tie the string, and then put on the band that pulls the vellum tight; put on six or eight brackets at equal distances apart, then pull down band evenly all round. Banjo makers use longer screws and nuts made specially for this purpose. Let the band stand up above the level of the edge of hoop, say about ¼ in., until the vellum is thoroughly dry before pulling down further, put on all the brackets, cut off projecting edge of vellum with a sharp knife, and then leave until thoroughly dry. When dry, it must be pulled down evenly and gradually, a little at a time, until the band is level with the edge of hoop. A good vellum, when properly put on and pulled down, ought to be as tight and with as little spring in it as a piece of board.—J. G. W.

Bassinette.—A. M. (*New Brighton*).—In your letter you say you are a toy dealer, and that you wish for detailed particulars sufficient to enable you to make a bassinette. Now at first I thought it seemed that you considered there was an opening in your business which could be beneficially filled by the sale of toy bassinettes; but upon thinking twice I concluded that you would not make such as these yourself, you would purchase them cheaper, and what you really required was a bassinette for your own, or, I should say, more correctly speaking, for your child's or children's use. I think you will agree with me that it is extremely unlikely that many readers would wish to make a bassinette; for we must not presume that all of them are married men, although I do not suppose by saying this that married bliss detracts from a man's character—the reverse is, I believe, the fact; but please remember I am a bachelor. Furniture, on the

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other hand, and many other things, can be used by both single and married persons. I, and others, frequently give designs for furniture, etc., to applicants in our "Shop," with but scanty details. The reason for this is that we do not wish to disappoint an inquirer, and so give as much as space will allow, knowing that many other readers are fully acquainted with wood-work details, and may find the designs acceptable. I could give a design of a bassinette here, but it would serve no useful purpose either to you or others, for a few pages of WORK would be required to adequately describe the construction; and I am afraid that but few readers would be so well acquainted with such particulars as with wood joints, etc. But, probably, in due course, you may find this subject taken up and treated upon fully.—J. S.

Cast Iron Softening.—F. J. (*North Finchley*).—Put the castings in an iron box enclosed in coke screenings, cover with a layer of fine sand well damped, heat in a furnace to a low red heat, and allow to cool gradually. Or steep for twenty-four hours in a mixture comprising one part of nitric acid to four parts of water. This will barely penetrate below the outside skin.—J.

Manufactories of Pins, Mohair Laces, and Elastic.—E. B. (*Bristol*) asks where manufactories of these articles are to be found in the United Kingdom. As pin manufacturers I may mention William Avery & Son, Headless Cross, Redditch; and as makers of mohair laces and elastic, Riddle Brothers, Great Victoria Street, Belfast.—S. W.

Enlarging Diagram, Paper Balloon Making.—W. T. P. (*London*) asks how to enlarge "fairly correctly" the diagram given in reply to J. T. J. (*Manchester*) at page 245 in "Shop," WORK, No. 67. I would, were I in W. T. P.'s place, prefer to construct, full size, entirely afresh, a segment of the balloon I intended to make, rather than enlarge the diagram alluded to, which is professedly only "something like" the shape. I therefore give him a method of ascertaining the form of the required segment, which is of other practical utility, and is capable of very varied application by draughtsmen of every description, and in handrailing for staircases. First draw a half elevation of your balloon full size, see Fig. 1, commencing with a perpendicular line *a k*, and a horizontal line *e e*, which I have marked "equator," as it represents a "great circle" of a globe; with *a e* in your compasses draw a semi-circle almost to *i* on the line *a k* (the portion I have dotted shows the part not necessary to be drawn except to determine the point *i* where it cuts the perpendicular). The radius *a e* should be half the intended height of the "globe" part of your balloon, exclusive of the neck, the length of which latter now decide and mark off at *k k*, and half the width of which is the length of the line *k k*; prolong this line horizontally to *m*, so that *k k m* is equal to *e e*, and then on *m*, as centre, with *m k* as radius, through *j i* describe an arc which will meet and die into the semi-circle at a point between *h* and *i*. This line *a e h i j k* is the profile or *contour* of the half of your balloon. Now divide *a e* into any number of equal parts—the more divisions the more exact will be your drawing; but I have selected only four so as not to encumber the diagram with too many lines, and so confuse it. With the same division in your compasses divide *e i* into the same number of parts, and *i k*, which should be half of *e i*, into half that number of equal parts, and draw horizontal lines from these points as at *b, c, d, e, f, g*, etc., to the periphery or profile line. To keep clear in your mind, regard these horizontal lines as representing the position of the smaller circles on a globe *i e*, as the edges of circular planes parallel to the equator. This completes the half elevation. Now proceed to make a half plan thus (see Fig. 2):—Drop the perpendicular of Fig. 1, viz. *a k*, still further, and upon any point thereon, say at *a*, Fig. 2, with *a t* as radius (which should be the same radius as *a e* in Fig. 1), describe a quarter circle or quadrant as shown, and draw from the centre *a* the horizontal line *a n*. Next decide how many segments you intend to make your balloon consist of; the more segments the rounder it will be, and the more troublesome will be the pasting. I have selected eight, because I am referring to OPIFEX's reply as above, but for large-sized balloons I should prefer ten or twelve. Anyhow, the construction is practically the same; whatever the number of segments decided upon may be divide your quarter circle into half that number, as you see I have chosen eight and divided my quadrant into four equal parts. Now join your first division at 2 with the centre *a* by a straight line and prolong it a little to *t*, and draw a horizontal line *t t* to meet it, which is a tangent to the quadrant *n t*. Keep clear in your mind what this line represents; it is the length of the curve *t* 2, straightened out, as though it were no longer *bent* but *flat*. It is not exactly the length being only an approximation to it, but it is sufficiently accurate for the purpose. This completes the drawing of the half plan. Now to find the points through which the outline of your half segments will pass, drop perpendiculars from Fig. 1 at *e, f, g, h, i, j, k*, on to the line *a n* in Fig. 2 as shown, viz., the dotted lines *e n, f* 2, *g* 3, *h* 4, *i* 5, *j* 6, and *k* 7. Then with your compasses turn the arcs, dotted, until they cut the line *a t*, which represents the edge of a section plane, right through the balloon, perpendicularly passing through its axis and north pole *a*, and remember, for clearness' sake, that where this section line *a t* cuts the quadrant *n t*, which represents in plan the equator *e e* (in Fig. 1), it gives the point on *e e*, at which such a section, if actually made, would cut the equator, viz., at the point 1, or nearly that point. I say nearly, because I have drawn the point 1 not as it would be if the segment were curved, but as if it were projected out to the flat, as W. T. P. wants to cut out his segments of *flat* paper. Therefore to find the point 1, draw the perpendicular upwards from the point *t* at the end of the prolonged portion of *a t* beyond the quadrant, till it cuts the equator in Fig. 1. Now proceed with the arcs 2 2, 3 3, 4 4, etc., in like manner, drawing the dotted lines *x y, x y, x y*, horizontally till they cut the section line A T; and erect perpendiculars

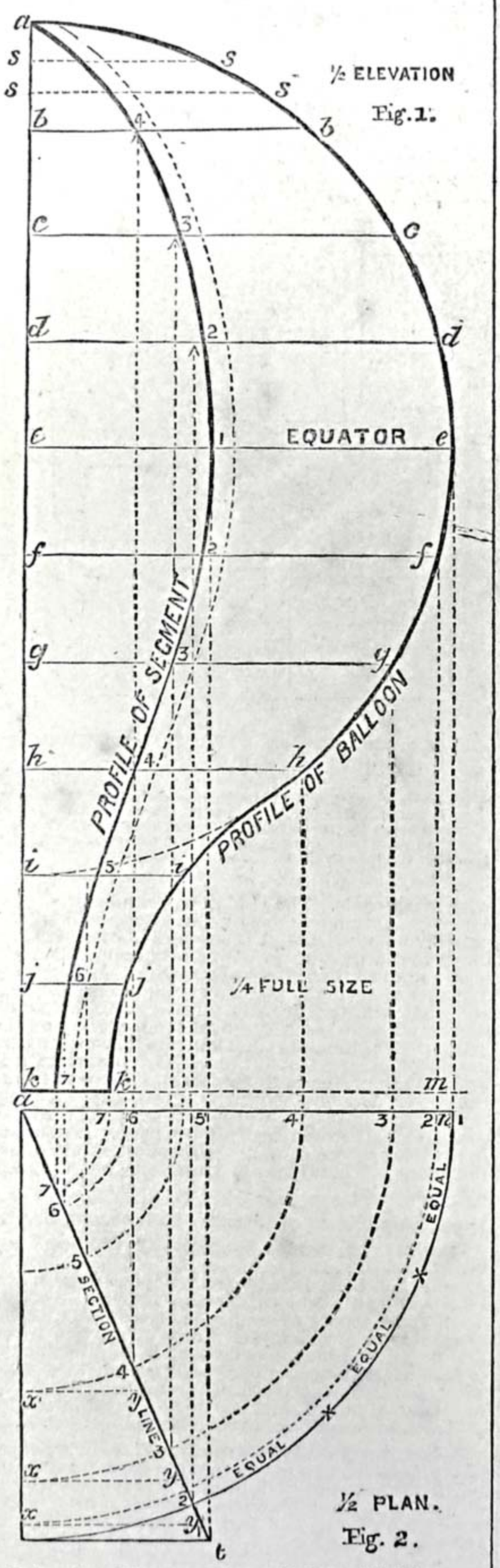

Fig. 1. Fig. 2.

Enlarging Diagram, Paper Balloon Making.

from these points of intersection cutting *b b, c c, d d, f f, g g, h h, i i, j j*, and *k k* (in Fig. 1) at the points 2 2, 3 3, 4 4, 5, 6, and 7 on those lines. In my diagram, as all this construction in dotted lines would be confusing, I have omitted to take the points from the intersection of tangents with the section line as bases for the perpendiculars, preferring to take instead the intersections of the arcs with section line as their bases, which is, I admit, inaccurate, but is near enough if allowance be made afterwards in sketching in the curve of the profile of half segment, as I have done above. This sketching will be rendered the easier, the greater are the number of horizontal division lines which have been drawn, and the greater will be the accuracy, especially at the crown on north pole of balloon, where I have dotted in the lines *s s, s s*, giving three extra divisions, thus regulating the curve *a* 4, if the same process of construction as that for the other points be gone through as before. When you have sketched in with a firm curved line joining these points 1, 2, 3, 4, *a* above, and 1, 2, 3, 4, 5, 6, 7 below the equator, dot in a parallel curve as shown for the lapping over of the pasting, or as the ladies would say, the "turnings in." Having thus obtained a half segment, trace it and turn it over on the perpendicular *a k*, Fig. 1, and laying eight sheets of paper the right size one upon another, with your pattern on the top, and with a flat iron or two, or other weight, to hold them down, cut right through them with a pair of shears, and all your segments will be exactly alike. Do not forget to cut by the dotted line or they will not fit when pasted, overlapping each other. You may vary the effect by using alternate segments of blue and white, pink and white, or other colours. If you desire a circular crown, as recommended by OPIFEX, cut a circle out and snip the edges every ½ in. to enable it readily to take the curve, or it will either keep flat or pucker. For the pasting follow instructions given by OPIFEX, except that gum is always very difficult to manage. I prefer stiff paste, such as printers use, which should be very sparingly used; it dries almost as quickly as it is put on, does not wet the paper so as to pucker it, and does not crack afterwards.—J. W. H.

Adhesive Gum.—J. T. J. (*Manchester*) wants "some kind of adhesive material which shall be in a portable form quite dry and solid, but which would dissolve in spittle or water and be quite tasteless." I do not know precisely where to recommend J. T. J. to procure what he requires, but he might ask at Grundy's, Exchange Street, or Lomax's in Cross Street, Manchester, for *mouth-glue*, if they are still in existence. I used to buy it there thirty years ago or more. If it is no longer sold, for there cannot be much demand nowadays for it, I believe it is made in the following manner:—Steep in cold water for several hours gelatine glue or best "Scotch," pour off, say, next morning, all superfluous water not soaked up, place the jelly in a clean glue-pot, boiling it at a regular heat for several hours, renewing the water in the outer pot as it simmers away, and taking care not to let the outer pot get dry, or it will burn and render quite useless the glue in the inner pot. When it runs clear and limpid in a fine stream from the stirring stick add a very small quantity of powdered sugar candy. Make a small box of wood, the inside of which should be the size of the stick required, say, 3 in. long by 1¼ in. by ⅜ in. deep; and when the sugar has been thoroughly melted and stirred well into the glue, pour out enough into the box or mould to fill it. First oil the mould with thick oil or lard to prevent it sticking to the glue. When cold this glue can be readily moistened by spittle, and will only taste slightly sweet of the candy; but no injury will be done to it, if, whilst hot, one or two drops of essential oil of cloves, cinnamon, or essence of lemon be added to give a flavour preferable to that of mere sweetness. Vanilla, raspberry, orange, peppermint, musk, or whatever flavour J. T. J. prefers can be as easily put in. I have mounted moist sheets of Whatman's drawing paper on drawing boards with mouth glue, both purchased as above, and with glue thus made for water-colour drawings, as also sheets of parchment for patent drawings, when such were required by the then Patent Law.—J. W. H.

Pattern-Maker's Tools.—A SUBSCRIBER.—No: your carver's tools will be of little value in pattern work. A few of the gouges will have a limited use in some core box work, and that is all. A carpenter's kit would, in the main, be required; but there are special tools, such as paring chisels and gouges, that are wanted in addition. I gave a list of pattern-maker's tools some time since to a correspondent in WORK, which you can turn up and refer to. You will not be able to work at pattern making without a lengthy previous training. A mere knowledge of wood working is not sufficient, but you must understand the moulding of patterns as well.—J.

Perforating Designs.—E. E. (*St. Pancras*).—Notwithstanding the very admirable way in which you describe all the details, an example which I wish every correspondent would follow, you leave me to guess one very important point—namely, the purpose of the perforation. I will therefore suppose that it is for the purpose of "pouncing." I have never done myself more than one or two of these, as I much prefer to use "gelatine tracings," or fish glue tracings, and now suggest to E. E. to try this plan from the following description, after which, in case he prefers "old grooves," I will give him a "wrinkle" in that direction also. Take a sheet of gelatine or fish-glue (procurable at any first-class artists' colourman) and fix down over your design (just as is done by chromo-lithographic artists), and with a "dry-point" carefully trace every line you wish to reproduce, cutting in the lines sharply like an etching. In designs where a part is repeated, trace only one repeat and such "register" marks as are necessary to ensure moving your tracing to the exact spot you require. (Fret workers please note this useful "Means, Mode, and Method.") Of course it will be necessary to trace right hand and left-hand portions of the design. Having prepared your tracing nicely, and sharply cut with the "dry-point," which, perhaps, I had better describe as a needle

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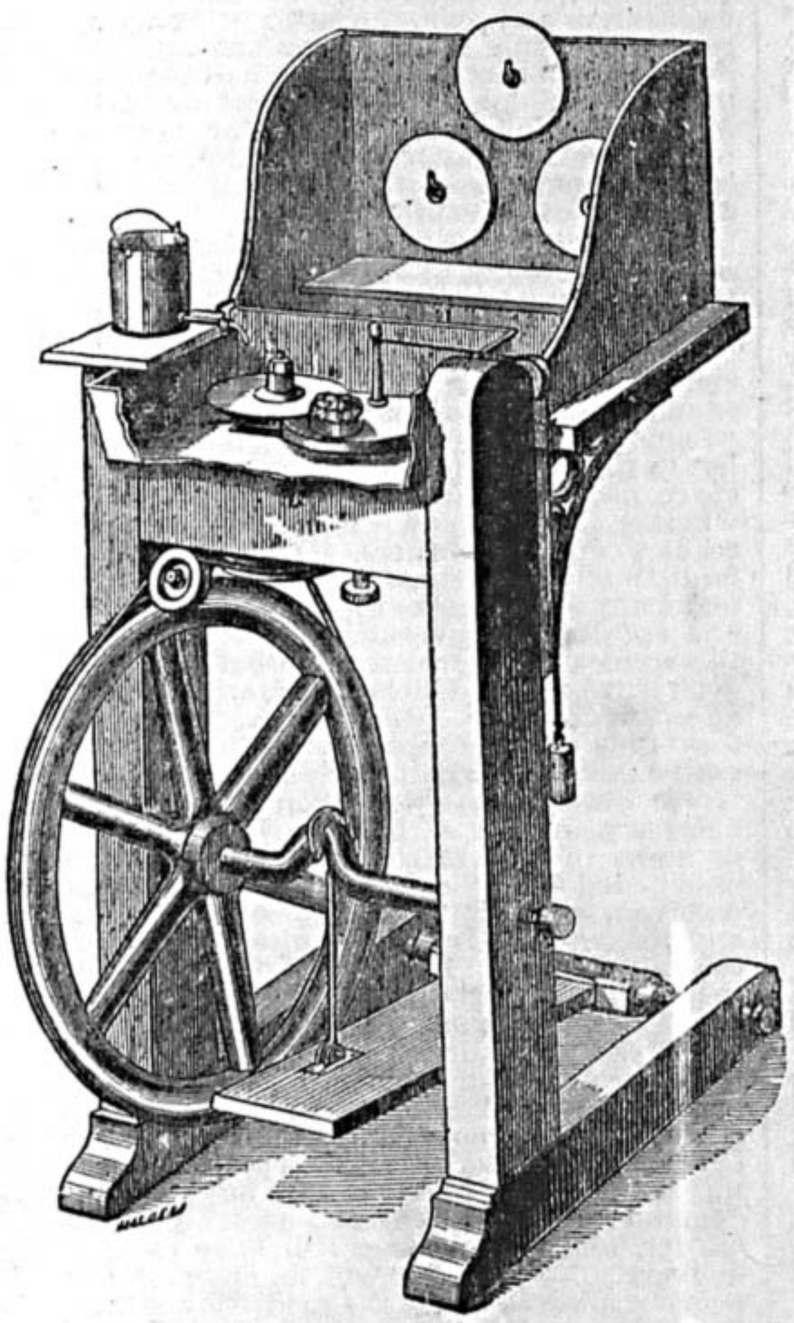
fixed in a holder or handle, with a triangular point, not a round one, fill in with dry, finely-powdered colour, white, black, red, blue, etc., according to your subject and its after processes (of which you must recollect I am left somewhat in the dark), every part of the in-cut line. Now turn your sheet, after dusting off carefully all superfluous colour from its surface, leaving only the lines full, downwards on to the surface you are about to use, and with a piece of indiarubber go all over the design, when you will press out, in continuous lines, the colour (which is upside down in the fine grooves of the tracing) on to your surface. I am obliged to assume, for the purpose of clearness of explanation, that E. E. and other readers are not conversant with this method; if he or they have seen or practised it, I crave their indulgence for the sake of others who may not have heard of it and yet may see some new adaptation of it. I would suggest to plumbers, for instance, that where they want to cut out a dozen or more pieces of sheet-lead all exactly alike, this plan would suit them "down to the ground." Once the tracing is made, it never deteriorates, and can be used over and over again simply by refilling the lines with fresh colour. I believe that with the Birmingham japanners these tracings have long ago superseded "pouncing," and for porcelain painting on flat surfaces, where plates, etc., are required all alike, it would be invaluable. A tracing thus made in full continuous line would take less time than perforating in equidistant dots; besides, the perforation is very imperfect, as the holes are merely punctured, not cut clean out, and the paper inside the hole-area, so to speak, still hangs about, as it is not got rid of. Again, in folding a design into quarters, as E. E. describes, some of the holes, when the perforated paper is again spread out flat, are upwards, and others downwards. However, to get over the perforating quicker, let me recommend E. E. to get a piece of vulcanised indiarubber about 1¼ in. by 1 in., and ⅛ in. thick, and force through it lengthwise eight or ten needles at regular intervals, until their points are in line. This can be done by warming the needles, not so far as to injure their temper, but enough to soften the rubber, which, when cold, will adhere to and maintain them in position. E. E. will now be able to prick eight or ten holes instead of one at a time, and by bending between thumb and finger the elastic rubber, he can fit any curve of the design, forcing the needles through by pressing with a flat piece of wood or bone with the left hand, using the right to keep the needles exactly on the lines of the design. Perhaps he might find, with some little practice, that even twenty needles would be manageable; or, again, he might have different tools, some five, some ten, some twenty points each, whilst for straight lines he might cement a thin piece of brass (such as printers' brass rule) to one side of the rubber to prevent its bending. Being most anxious to help, if E. E. or any other correspondent tries either plan and should encounter any difficulty, pray write again detailing minutely what the obstacle is. Let me add, that when requisite to repeat left-handed a portion of a right-handed design accurately, a very simple expedient only is necessary, viz., to fix to a sheet of glass the design with its face down, and then trace on the gelatine through it by means of light, or reflected light behind it, tracing the other part with the face of the design next the gelatine, which will give the right and left properly reversed. Tell us how it acts.—J. W. H.

Painting Cart.—APPRENTICE (*Westfield*).—Your chief difficulty will be in getting the groundwork right preparatory to painting your cart. To paint it from the bare wood to the finishing process of varnishing proceed as follows:—In the first place, give the cart a coat of lead colour all over, composed of boiled oil, white keg lead, and a little lampblack. In a few days after give another coat of lead colour thinned down with turps. When dry, stop all screw or nail holes and cracks up with putty made of whiting, keg lead, and japan. Stop all over, including the wheels, and do not miss a single place. In a couple of days after give another coat of lead colour. Now mix a can of filling. Get 3 lbs. of patent filling and 1½ lbs. of keg white lead, and mix into a stiff paste. Put this into a can, and thin down with half a pint of gold-size and varnish mixed; thin it down also with turps until workable. Use a moderately large tool, and give the top and the outside of the body only a coat of this filling until it has had six coats, giving it one coat daily. Now mix a coat of staining colour. Get some red Indian or Tuscan, and mix in pot with turps, and also a little gold-size just to bind it, and give the filling a coat of this all over. When dry, commence to rub or scour down. This rubbing down is very dirty work, but upon it depends the after beauty of coach painting. Get a piece of pumice-stone, sawn across the grain, and a bucket of clean water, with a sponge and leather; also a piece of bath brick and a flag. Rub the pumice-stone upon the flag to get it smooth, using plenty of water. Get your sponge full of water, and rub the panel; then scour the panel with the pumice-stone, and keep scouring and rubbing and washing the panel off until you get all the red off, then it is quite smooth. The Bath brick is to keep the pumice-stone clean. When the body is rubbed down, leave for a couple of days for the water to evaporate out of the filling; then dust well down, and give it a coat of finely-ground lead colour. When dry, sand-paper it all over with very fine sand-paper, and give another coat of lead colour. If the cart is to be painted black, give it a coat of dead black, and afterwards a coat of black japan. If of another colour, first give it a coat of dead colour, and, when dry, add varnish to the colour left, and give it another coat of varnish colour. If the wheels and springs are to be painted lemon or vermilion, you must paint the wheels, springs, and shafts white, with a little of the colour added to it. This will make a good ground to work upon. Next flat the cart down, and the wheels, etc., with a cloth pad and water, using a very little of powdered pumice-stone. Next pick out and fine line the cart, wheels, etc. Also paint the inside of the cart, all round the sides, under the seat, buff or cream, made of white lead mixed with oil and a very little of black japan. Next wash off the cart well; then dust it from lint, etc., and give it a good flowing coat of carriage varnish in a warm room, keeping the heat up until dry.—W. P.

Cutting Agates, Jaspers, and Opals.—E.L.B. (*London, S.E.*).—The cutting of opals with the fewest number of tools was described in "Shop," WORK, No. 59, and this is in fulfilment of my promise to make inquiries about some simple means of cutting and polishing the harder stone—agate. In that quest I have not had perfect success, but, as it may meet your requirements, I proceed to describe it. First and foremost, it seems to me that you must have a lathe of some sort or other, for the amount of friction to be obtained by using one's hand only makes the job an everlasting one, if even it is not quite impossible. Given the lathe, then you must fit on to it three



Lapidary's Lathe.

discs of wood as large in diameter as you conveniently can—suppose we say nothing under five inches? The first of these—the wood mill or lap—should be made of sycamore wood, at least ¾ inch thick. The powder used with this mill is fine emery, and is applied to the front with water. With this you will have to do all your shaping and cutting, and all hollows and irregularities of shape must be removed by this mill. Another disc of wood you will have, use in making a list lap. That is made out of the selvedge of cloth, yards of it coiled round and round in one compact mass, and finally glued firmly to the wooden disc that is already fitted, or that can be fitted, to your lathe. Any wood will do for this one and the next, providing that it will not split. The material used with this list mill is powdered pumice and water. When you have got a good surface on your stone with this, you will require another lap for finishing with, to be used with putty powder and water. Now, if you make two list mills, one can be used for putty powder, but a disc of wood faced with buff leather is the correct article. The stones are fixed for cutting in the same way as opals, and of course you can polish opals on these laps better than in the rough method spoken of before. The sycamore wood, I am told, can be obtained of Tyler, Mortimer Market, Tottenham Court Road. Jewellers sometimes use arrangements like those described above, but it is only for an odd job. Such tools restrict the worker to narrow limits, for no means are here used to slit pieces off, they must be ground away. Then the vertical rotation of the mills is not considered the best, it is the horizontal portion which is used by the lapidaries for cutting everything from pastes to diamonds. Evidently other scientific amateurs have been in the same straits, for one of them has devised a lapidary's lathe for cutting microscopic specimens, which, of course, can be used for the simpler work now in question. It is made exclusively by Messrs. Cotton & Johnson, 11, Gerrard Street, Soho, W.C., and its price, with the same fittings as the one I shall next describe, is twelve guineas. The diagram herewith is the general aspect of the machine, and it possesses a great advantage to amateurs, viz., it is driven by the foot, consequently both hands are at liberty to attend to the work. One firm publish a small pamphlet, which you could, no doubt, obtain by writing for it or calling. The other one they make is a "portable lapidary machine," length thirty-one inches, breadth sixteen inches, height over all twenty inches, which can be reduced to seven and a half inches when the separate parts are taken to pieces and packed inside. With this and the other is supplied a very clever arrangement for holding and adjusting the position of the stone with regard to the mill; it is called a facetting machine, and they claim for it that it is possible for any amateur to cuts facets on stones correctly. There are three laps, viz., lead, wood, and the slitting disc, and three cement cups, and the price is £6 15s. This is a horizontal mill, and has to be driven by the left hand while the right attends to the work. The polishing powder (mine are what they consider the complete set), the cement, and cement sticks can all be bought there, as well as the diamond, already powdered, for this slitting mill. For a great amount of detailed information on this subject, you cannot do better than get Vol. III. of Holtzapffel's "Turning and Mechanical Manipulation," where under Section II. is found a descriptive catalogue of the apparatus, material, and processes for grinding and polishing commonly employed in the useful arts. This part goes pretty fully into the matter, but further on, in the same volume, is a chapter on lapidary's work; it is undoubtedly the best and most complete that has been published. By-the-bye, the facetting machine replaces the "gim" peg spoken of and illustrated in that book. If you study this, there is not much fear but you will succeed; but if, after all, there are any details you cannot master, then I am still at your service with the greatest of pleasure.—H. S. G.

Lantern Lens.—J. MCMO (*Edinburgh*).—In all probability your lens was originally made for photographic work, and if not of too long a focus—that is to say, supposing that it will give a picture on the ground glass when held in front of the lens opening in a camera and properly focussed so as to obtain a sharp picture—you will be able to use it as such without alteration. If, however, the picture is formed further away from the ground glass than the length of the camera will allow, you must use it on a camera of longer focus. By uncovering the front combination of the lens you will see that it is formed of a double convex and a plane convex lens, with the concave side of the glass ground in such a manner that the convex side of the other fits into it, the two being cemented together with Canada balsam. If you can remove the back combination from the mount and secure this front lens into its place you will thus have a view lens suitable for ordinary landscape work; but you will in all probability require a long focus camera, as it is the two combinations together which form the short focus usually required in a lantern lens. Even supposing that the lens was not intended for photographic work, you will be enabled to use it in the manner above directed; but it will doubtless be slow in working, and will most likely be capable of giving pictures 8½ in. by 6½ in. (whole plate size).—C. A. P.

Bright Stove Work.—STOVE MAKER.—I do not quite understand your question. You say you want something that will keep your polished parts of stoves bright for an unlimited period. Do you want the polish to show, or does it not matter as long as it does not rust? If the former, I should say, give the parts a coat of clear varnish, the polish will then last as long as the varnish does; but as you make them for sale, I should think the better plan would be to melt some mutton suet in a clean vessel, and rub the bright parts with it whilst hot; of course the polish will not show, but it can be easily rubbed off to show a customer.—R. A.

Chucks.—J. S. (*Dorchester*).—In Vol. IV. of Holtzapffel's "Mechanical Manipulation," pp. 567, 569, you have a full description of chucks for turning tobacco pipes. It is the best book on plain turning; published by Holtzapffel & Co., 64, Charing Cross, price 20s. or 25s. I have not myself done that work, but could sketch the chucks for you if you don't care to get the book.—F. A. M.

Fountain.—RALPHO.—I am unable to comply with your modest request for "an everlasting perpetual fountain," but an article on quasi "Self-acting Fountains" appeared in No. 69. This will probably interest you.—C. M. W.

Lathes.—C. C (*Harlington*).—I hope to write again upon "Lathes and Turning Appliances," and the subjects you name should come amongst the first to be treated.—F. A. M.

Answers in "Shop"—C. (*North Shields*).—Arrangements are being made by the publishers of WORK to deal more promptly with the great strain upon the "Shop" columns of WORK.—F. J. C.

Millboard Rings.—F. T. (*London, N.*).—The best tool I could recommend for the work is a mount cutter's knife, which needs some practice

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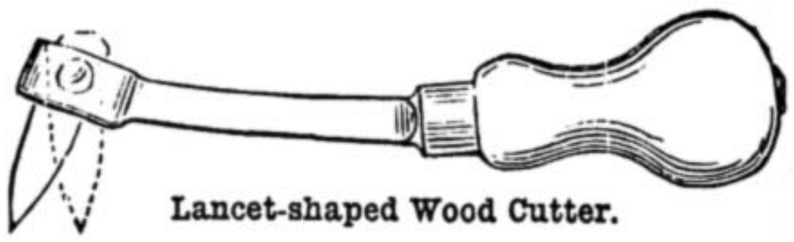
to use with economy; or if you cut a large number one size it would be the best way to have an iron stamp made and a letter press would cut them; but I should think you could get them ready cut at a very small cost. I should advise you to send a pattern and quotations to the City Frame Co., 29, Basinghall Street, London, E.C., who would give you a price for the work ready cut.—G. R.

Printers' Wood Letter.—G. P. (*Sussex*).—Wood type has for many years been cut entirely by machinery, first on end grain and latterly on side grain wood, by means of a sort of governing pantograph with a revolving cutter at the other end, and a tracing point wherewith to follow the copy at the actuating end. By this means the letter can be cut to any proportionate size of the original by merely altering the foci or centres of the pantograph. But if G.P.



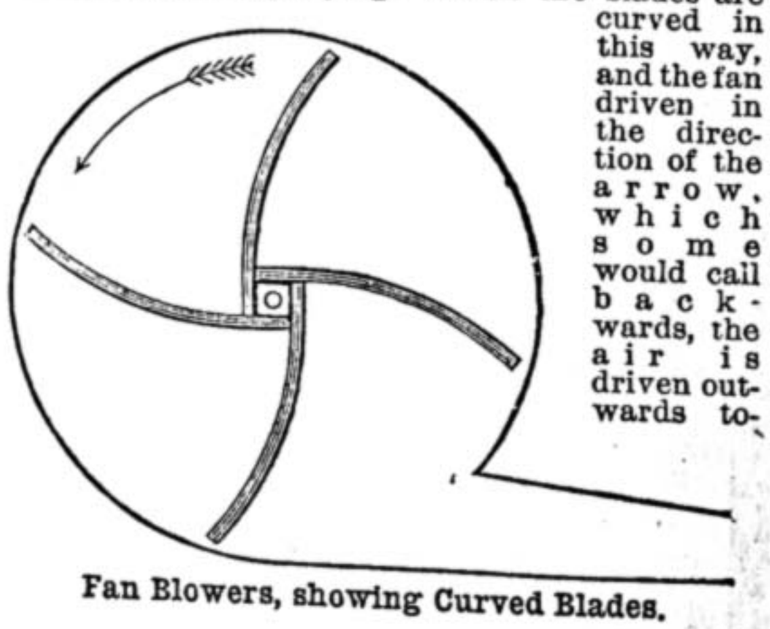
Lancet-shaped Wood Cutter.

wants letters, say, anything above 24 line (*i.e.*, more than 4 in. high—6 lines to pica equals 1 in.), he can cut them in pine (best) with a tool similar to our illustration for outlining, and take out the white portions with small gouges cheaper than he could purchase them. If pine be well soaked in raw linseed oil and allowed to dry, it will last as long as any hard wood such as sycamore, and is only half the weight, which enables the formes to be carried about at half the cost.—J. W. H.

Metal Tubing for Nickel-plating.—W. L. C. (*Aberdeen*).—Metal tubing of all sorts can be obtained from Messrs. Cotton & Johnson, 14, Gerrard Street, London, W. They supply some of the large nickel-plated pencil manufacturers, so you will get exactly what you require there. The particular make used is called "triblet drawn tubing," that means that the tube is drawn over a triblet or mandrel, the result being that it is smooth and regular, both inside and outside. This sort is kept in stock from ¼ in. to 1½ in. diameter. Its cost is from 1s. 10d. per pound downward. It is kept in lengths of about 4 ft., but the firm supply any lengths as required. The small tubing down to ⅛ in. diameter is not triblet drawn. You will find that the firm will pay immediate attention to any communication you make.—H. S. G.

Overmantel.—E. H. (*Stockport*).—There is no reason why you should not make use of picture-frame moulding for such an overmantel as you describe, but I am afraid the result will not be happy. Of course a great deal depends on the pattern of the moulding you select, and the simpler it is the better. If you are content to have only one frame, oak moulding will look very well, but I do not like the three frames. You cannot prevent the end ones looking too much like additions. They will not look like part of the original design, but will give the impression of being the result of an afterthought. If you want to frame the oleographs, do so, but do not join their frames to that of the mirror or centre part. Leave a small interval, and then there need be nothing unsuitable in the arrangement. Sizes must depend a good deal on your own taste and on circumstances of which I know nothing, such as size and height of room, limit of expense to which you wish to go, etc. Get the spindles done by any turner.—D. D.

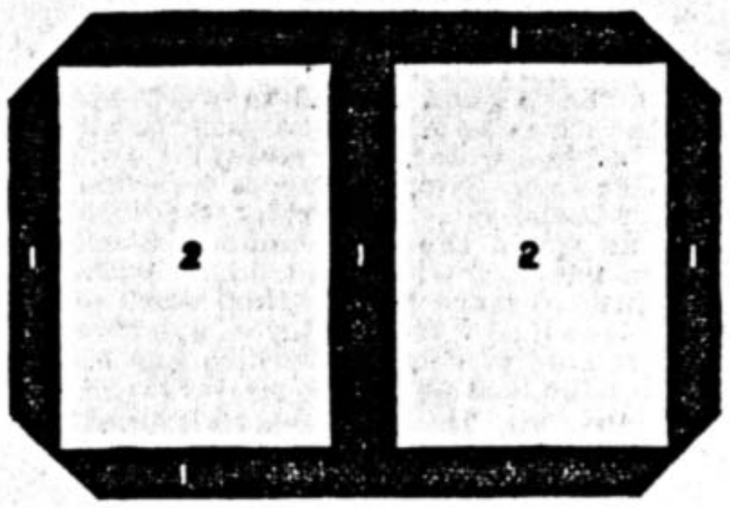
Fan Blowers.—W. J. (*Cheltenham*).—All that is meant by curve refers to the blades of the fan, which are curved to radius of 12 in. or less, as shown in the sketch accompanying. When the blades are curved in this way, and the fan driven in the direction of the arrow, which some would call backwards, the air is driven outwards to-



Fan Blowers, showing Curved Blades.

wards the circumference of the case. If it were driven forwards—*i.e.*, opposite to the direction of the arrow—the air would be gathered in towards the centre; of course it would blow after a fashion, but not nearly so effectively as by the former way.—A. S. P.

WORK for Reference.—'PRENTICE BLACKSMITH.—There have already appeared in WORK designs and suggestions for covers and fretwork case for our esteemed and useful periodical. 'PRENTICE BLACKSMITH, however, does not seem to have been suited. Therefore we will try another plan. If he can make or procure a portfolio of the required size—that is, a pair of covers joined to a flexible back—he can easily stretch a number of elastic cords from end to end of the central portion, and



Folio for WORK. 1, 1.—Leather or Cloth Cover. 2, 2.—Millboard. The Margin of the Cover is to turn inside the Boards; a Paper Fly-leaf will cover the inside and make all neat.

slip each number under one of the elastic cords. P. B. had better read Mr. Clarkson's capital articles, and he will learn how to make a portfolio very quickly; but if he takes a pair of millboards the required size, and covers them with leather—I have used skiver and roan, the latter being upholsterers' remnants—using glue and patient care, I have no doubt he will succeed; but the best plan after all is to have the numbers bound, or, taking advantage of Mr. Clarkson's instructions, bind them yourself. The folio, however, may be a useful hint, and instead of leather, American cloth or leather cloth is a cheap and durable substitute.—B. A. B.

"WORK" Exhibition.—The secretary writes, in answer to a crowd of correspondents, that he takes the words "subscriber to WORK" in their widest sense—*i.e.*, any reader who "subscribes to" or "endorses" our efforts to make it a useful magazine by making it known amongst his, or her, friends, and takes an interest in the articles and in "Shop." No proof is required; it must be, and is, left to the conscience of everyone who applies for space, and to his, or her, witness's conscience as to whether they are now, or will be in future, WORK readers and co-workers. He also wishes it to be distinctly understood that it is out of his power to make any individual exceptions from the conditions and regulations governing the exhibitors, and in this connection wishes to point out that no exhibit, even if it bear the official label, will be received in an *unpacked* state. He finds many people imagine that they require separate application forms for each exhibit. This is not the case unless they come under different groups, when a separate form is necessary only for such group, be the exhibits one or more, in such group. Official labels are in no case issued until the application forms are not only received, properly filled up, but are also granted; and these labels cannot be afterwards exchanged or supplemented. It is as well, therefore, to send a requisition with the application for space, stating whether one or more packages will be necessary, noting that in all cases a separate label will be issued, even to the same exhibitor, for each *group* under which he enters, which, in case he chooses to enclose both in one package, should *both* be affixed outside. Exhibitors in London preferring to deliver their exhibits personally cannot have them back on demand; they will in all cases be returned by carrier, and the carriage will have to be paid on delivery. *No exhibitor* will, on any pretence whatever, be allowed inside the exhibition either before its public opening or after its final closing. In conclusion, the secretary earnestly wishes intending exhibitors to forward their applications for space to him at the earliest possible moment, and not to procrastinate by waiting till the 30th October (the last limit allowed), as at the present rapid rate all available space will be allotted long before that date. Finally, he begs correspondents to write their names and addresses legibly, as several letters have been returned from the post-office owing to uncertainty arising from such illegibility.—J. W. H.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—T. K. (*Plymouth*); E. E. K. (*Plymouth*); FRETWORK; AMATEUR; E. H. (*London, N.W.*); FAIR PLAY; J. H. G. (*Sheffield*); S. E. (*Camberwell*); J. F. (*Birmingham*); J. S. B. (*Devonport*); W. P. B. (*Southport*); SAWYER; R. W. M. (*Kildare*); OLD BOY; J. M. (*Glasgow*); W. H. P. (*Chelmsford*); W. C. B. (*Poplar*); R. J. W. (*Fulham*); E. T. (*Dudley*); J. M. K. (*Westmoreland*); D. L. (*Blairgowrie*); J. H. F. (*Sheffield*); R. H. P. (*Cornwall*); G. B. (*Islington*); W. C. (*Hulme*); J. B. (*Devon*); A. M. (*Willenhall*); YOKEL; SAUL; MIEUX QUE CA; D. C. (*Kilmarnock*); BARTLETT; LIMITED; ELECTRIC; F. B. (*Cardiff*); E. G. W. (*London, S.W.*); CONSTANT READER OF "WORK;" C. C. (*London, N.W.*); E. W. (*Peckham*); G. J. C. (*Lewisham*); S. J. S. (*Acton*); W. C. (*Birmingham*); H. J. G. (*Northampton*); J. T. W. (*Sunderland*); C. W. (*Barnsbury*); BOOT-LASTS; F. J. C. (*Maidstone*); ONE OF OUR READERS; E. O. N. (*London, E.*); A. B. L. (*Barnsley*); E. A. D. (*London, W.*); BAMBOOZLED; R. W. (*London, W.C.*); ARNOLD; AMATEUR; J. J. (*Glasgow*); W. T. (*Exeter*); AMBITIOUS HEIGHT; A. S. (*London, W.*); J. W. R. (*Hants*); F. C. J. (*Rotherham*); J. G. (*Sheffield*); W. M. (*London, N.W.*); R. H. W. (*Hackney*); H. M. (*Liverpool*); J. MCA. (*Barrow-in-Furness*); H. H. M. (*Glasgow*); KALULU; A. R. (*Glasgow*); W. MCC. (*Hull*); W. G. (*Devonport*); R. J. A. (*Seacombe*); F. T. (*London, N.*); TAILOR; T. D. (*London, W.*); R. J. G. (*Northampton*); GHOST; W. H. S. (*Hammersmith*); F. W. C. (*Stratford*); S. C. (*Sheffield*); E. L. T. (*Oporto*); F. W. (*Kennington*); CONSTANT READER OF "WORK"; N. MCK. (*Oswestry*); R. W. H. (*Chester*); H. M. F. (*Colchester*); A. S. T. (*London, E.C.*); J. B. (*London, W.*); A. H. (*Winsford*).

Trade Notes and Memoranda.

IN America the use of raw hide for gearing has come largely into use. It is often necessary to employ gear wheels running at a high rate of speed, and the wear which takes place, together with the accompanying noise, makes their use objectionable. Many attempts have been made to overcome these defects, and patented solid raw hide gears, made by the New Process Raw Hide Company, of Syracuse, N.Y., have met with remarkable success. In the manufacture of the raw hide great pressure is applied, and all superfluous matter eliminated, leaving the same extremely light, and making it the strongest material for its weight known. The blanks are first cut, then a number laid together, and the teeth afterwards shaped out. The wheels so made have come into extensive use on electric cars, where their silent and even operation has added much to the comfort afforded by these cars. These gears may be run together or against metal gears, and require no lubrication. They are not only remarkably durable in themselves, but it is claimed that the life of large iron gears is longer, used in connection with them, than when running with metal pinions.

A SYNDICATE has been formed and the money found for the utilisation of the Niagara as a motive power. The names of Mr. Pierpont Morgan, Mr. W. R. Vanderbilt, Mr. D. O. Mills, and Mr. Jessop, guarantee the interest taken in the scheme by American capitalists. The president is Mr. Edward D. Adams, with vice-presidents, treasurer, and engineers complete. It is found that 4 per cent. of the total flow of water over the falls would develop 120,000 horse-power; and the scheme is to divert this small part of the terrific current around the town of Niagara, and bring it out, by means of a tail-race, underground. The new company, with property above the upper rapids, will take the water from the river by short canals to the wheels located in vertical pits, and from them discharge through a tunnel used as a tail-race into the river below the falls. This rock tunnel, of 490 square feet area, will have sufficient inclination to carry off the whole of the water which has passed through the turbine motors. Although it is proposed to develop a very large amount of power, the water abstracted from the river will be a very small proportion of the whole, and its loss will not be noticeable. Four per cent. of the flow of the river would provide 120,000 horse-power, assuming that only 140 ft. of the actual fall of 200 ft. were utilised. As the town of Buffalo is eighteen miles distant from the falls, the power will have to be transmitted to it by some means yet to be determined. The choice lies between rope transmission, as at Schaffhausen; transmission by compressed air, as at Paris and Birmingham; by pressure of water, as in London; and by electricity. The Cataract Company have resolved to invite from certain selected engineers and engineering firms plans for the utilisation at Niagara of 120,000 horse-power, and to submit the plans for an authoritative opinion to the judgment of a scientific international commission.

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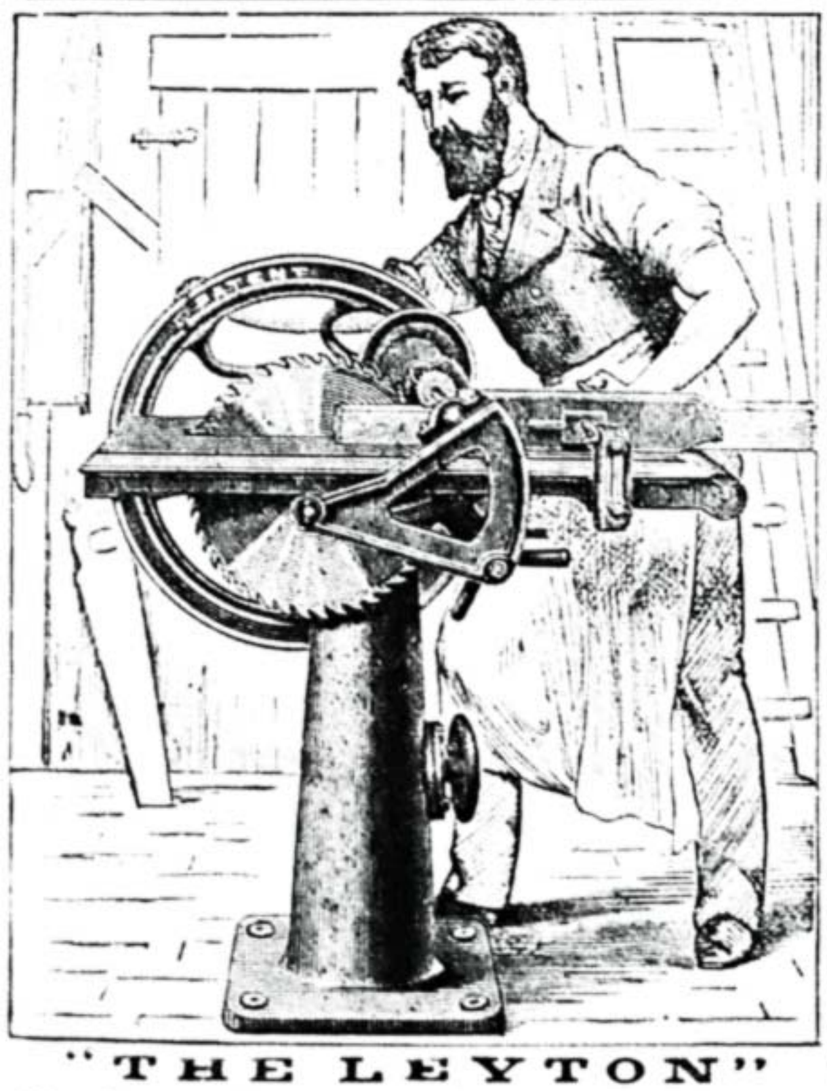

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Classification of Exhibits

For which PRIZES, MEDALS, and other Awards are offered to Readers of

"WORK,"

The Illustrated Magazine of Theory and Practice for all Workmen, Professional and Amateur.

THE EXHIBITION TO BE HELD AT

THE POLYTECHNIC INSTITUTE, Regent Street, W., Dec. 29th, 1890, to Jan. 10th, 1891, inclusive.

GROUP I.—**WORK in Wood.**—Furniture, Cabinet Work, Carving, Fretwork, Pattern-making, Turning, Carriage and Cart Building, Wheel-making, Pulley-block-making, Carpentry, Marquetry, Parquetry.

GROUP II.—**WORK in Metals.**—Casting, Forging, Stamping, Die-sinking, Medal-striking, Finishing, Turning, Screw-cutting, Repoussé Work, Arms (Guns, Rifles, Pistols, Swords, Bayonets, Lances, Armour), Armour Plating, Iron Ship-building, Amalgams, Mixed Metals.

GROUP III.—**Tools for WORK.**—Hand Tools, Machine Tools, Tools for Sharpening Tools, Photo-micro and Electric Apparatus (except Lighting and Telegraphy), as Cameras, Magic Lanterns, Slides, Microscopes, Surgical Instruments, Mathematical and Drawing Instruments, &c.

GROUP IV.—**WORK in Design only.** *Exhibits to take the form of Drawings or Models.*—Designs for Decorative Purposes (including Stained Glass). For Architecture (including Ventilation). For Mechanical Purposes, such as Boilers, Engines, Machines. For Engineering, Forts, Ships, Roads, Bridges, Canals, Sewers, Railways, Trams, Balloons, Parachutes, Ambulances, Tents, &c.

GROUP V.—**WORK in Printing.**—Letterpress, Type Founding, Press-work, Machine-work, Lithography, Drawings on Transfer Paper, on Stone, on Wood, on Zinc; Engraving on Steel, Copper, and Wood; Colour Work, Photography on Stone, on Wood, Photographic Printing, Bookbinding, Music Printing, Transferring, Stereotyping, Electrotyping.

GROUP VI.—**WORK in Domestic Appliances.**—For Decorative Purposes. For Cooking (Hardware, Glass, Pottery, Faïence), Heating, Washing, Drying, Lighting, Cleaning, Sewing, Bathing, Teaching; Home Recreation, Games, Gymnastics; Hygiene; Toys, Dolls, Waxwork (Figures, Fruit, and Flowers); Telegraphy; Watches, &c.; Telephones; Basket-work.

GROUP VII.—**WORK in Wearing Apparel.**—In Tailoring, Hat-making, Boot and Shoe-making, Mantua-making, Millinery, Beading, Dress-making, Baby Linen, Lace-making, Knitting (Machine or Hand), Needlework (Machine or Hand), Button, Cotton, Silk, and Thread-making, Hose, Gloves, Wigs, Theatrical Costumes, Court-Dresses, Uniforms, Liveries, Belts, Buckles, Furs, Feathers, Artificial Limbs, Eyes, Teeth, &c., Abdominal Belts, Trusses, Surgical Bandages and Appliances, Electric Belts and Bandages, Jewellery, Hair-dressing.

GROUP VIII.—**WORK in Painting and Decorating.**—House Painting; Decorative Painting in Oil, Distemper, Flatting, and Fresco; Gilding, Graining, Marbling, Sign and Facia Writing, China Painting, Carriage Painting, Heraldic Painting, Scene Painting, Stained and Painted Glass and Imitation ditto, Plaques, Panels, Appliances for Painting and Decorating.

GROUP IX.—**WORK in Textile Fabrics and Leather.**—Curtains, Carpets, Blinds, Rugs, Upholstery, Screens, Brackets, Frames, Harness, Saddlery (Civil and Military), Bags, Trunks, Portmanteaux, Travelling Bags and Trunks, Dress-baskets, &c.

GROUP X.—**WORK in Musical Instruments and Music.**—1. Organs, Pianofortes, Harps, Violins, Banjos, Mandolins, Guitars, Cornets, Trombones, Clarinets, Oboes, Drums, Flageolets, Flutes, Piccolos, Fifes, Bagpipes, Triangles, Cymbals, Metronomes, &c. 2. Musical Compositions, Systems of Teaching, Appliances for Learning.

GROUP XI.—**WORK in Watches, Clocks, Alarms, Bells, &c.**—1. Designs for any of the above (including Musical Boxes and Mechanical Contrivances). 2. Actual Models or finished Working Specimens, Clockwork for Lighthouses, Burglar Alarms, Electric Signals.

GROUP XII.—**WORK in Building Appliances and Material for Building.**—Bricks, Tiles for Floors and Mural Decoration, Stone Masonry and Carving, Terra-cotta Chimney-tops, Drain Tiles and Pipes, Sanitary Stoneware and Pottery, Mosaics, Hot and Cold Water Appliances, &c., Baths and W.-C.'s.

GROUP XIII.—**WORK in Chemical Processes and Products.**—Stains, Dyes, Colours, Inks, Varnishes, Soaps, Cleansers, Disinfectants, Food Compounds, Drinks, Igniters, Fuels, Explosives, Gas Manufacture, Manures, Detergents, Antiseptics, Anodynes, Electric Lighting, &c.

GROUP XIV.—**WORK in the Utilisation of Waste (Novel and Original Feature).**

Utilising Waste Space in crowded Cities and Towns.
" " " in Agricultural Districts.
" " Heat.
" " Water (including Utilisation of Tides).
" " Sewage.
" " Products hitherto unused.
" " Labour, Manual and Mental.
" " Time.

Utilising Waste Capital (including legacies not applied for by claimants).
" " Charity Funds, which have exceeded testators' expectations.
" " Power, of Combination for legal purposes, Purchasing power, Co-operation, Power of oppression by sweating.

Exhibits in this Group to take the form of Essays, Plans, Précis of experiments, and even suggestions.

There will be three classes of Exhibitors, viz.:—

1. **Workmen** or **Workwomen** actually employed and gaining their livelihood in and by the craft under whose name they exhibit.
2. **Apprentices,** *bonâ fide*, serving an apprenticeship to the craft or calling under whose name they exhibit (whether indentured or otherwise).
3. **Amateurs** or connoisseurs who either do not practise any craft as a means of subsistence, or who exhibit in any other group other than their own craft.

The Exhibits will be judged in accordance with the above classification of Exhibitors.

Jurors shall judge all Exhibits in Groups I., II., III., X., according to workmanship alone, irrespective of design, which may be new or old.
Jurors shall judge all Exhibits in Groups V., VI., VII., VIII., IX., XI., XII., according to merit in design associated with meritorious *workmanship*.
Jurors shall judge Exhibits in Groups IV., XIII., and XIV., solely as to novelty, originality, and improvement upon known and existing forms, formulæ, and processes, designs, or inventions, irrespective of workmanship in their execution.
The Jurors will be practical and competent experts.
Exhibitors may declare their Exhibits as not for competition.

CASSELL & COMPANY, LIMITED, *La Belle Sauvage, Ludgate Hill, London.*

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CONDITIONS AND REGULATIONS.

1. Any reader of "WORK" shall be eligible to exhibit on the Conditions and under the Regulations stated below.

2. All intending Exhibitors must make the prescribed entries upon the printed form (hereto annexed) and sign the same in the presence of a reliable witness, who shall also sign and give his address and occupation. N.B.—Any false or fraudulent statement will disqualify.

3. Every Exhibitor is to pay the carriage of his Exhibit to and from the Exbibition. The Proprietors of "WORK" will supply printed labels for attaching to packages. It must, however, be distinctly understood that the Exhibit will be entirely at Exhibitor's risk. No Exhibit will be rèceived unless it is securely packed and bears the official label.

4. Every Exhibitor must fill in, on the Application Form, the value or price he places upon his Exhibit, and of any separate portion thereof, so that in case of sale and for Insurance purposes, no dispute may arise.

5. The Secretary will advise, on printed forms, the receipt of and acceptance of all Application Forms which are correctly filled up, and will return any for correction which are not filled up correctly. All correspondence must be addressed prepaid to the Secretary, "WORK" EXHIBITION, LA BELLE SAUVAGE, LUDGATE HILL, E.C. *All letters requiring an answer must be accompanied by a stamped and addressed envelope.*

6. The Awards of the Jurors shall be final and binding without appeal.

7. The Proprietors of "WORK" reserve the right to decline any Exhibit which they may deem unsuitable or unworthy, and the Secretary will advise the Exhibitor of such decision.

8. All Exhibits must be forwarded so as to arrive on the 19th or 20th December, and not before. Applications for space must be filled in and forwarded at latest by the 30th day of October, after which date they cannot be received, and no labels for carriage will be thereafter issued. It is intended to open the Exhibition on Monday, Dec. 29th, 1890, and to keep it open till Saturday, January 10th, 1891.

9. Every Exhibitor will be entitled to a free Admission Ticket, not transferable, available during the Exhibition. Exhibitors at a distance, unable to come to London, may have such ticket transferred to a London friend on nomination by previous arrangement with the Secretary. Applications for Free Tickets for Attendants should reach the Secretary not later than the 10th of November.

10. No articles must be removed till the close of the Exhibition.

11. The Proprietors of "WORK" reserve the right to remove the Exhibit of any one who does not conform to the regulations, and also the right to alter, add to, or cancel, any of these Rules.

12. AWARDS, MEDALS, PRIZES, &c., will be forwarded, post free, to all Exhibitors who do not present themselves at the DISTRIBUTION OF PRIZES, the date of which will be duly announced in "WORK."

PRIZE LIST.

Group Prizes.—GOLD MEDALS.—A Gold Medal will be given for the best Exhibit in the whole Exhibition (except Group XIV.), together with a First Class Certificate. A Gold Medal will be awarded with a First Class Certificate to the best Exhibit in Group XIV.

SILVER MEDALS.—A Silver Medal, a Money Prize of One Guinea, and a First Class Certificate, will be awarded to the best Exhibit in each of the Groups as classified above, except Group XIV., where a Gold Medal will be awarded.

Class Prizes.—BRONZE MEDALS.—A Bronze Medal, a Book Prize of Half-a-Guinea, and a Second Class Certificate, will be awarded by the Jurors to the best Exhibit in each Class or Sub-Division of Groups.

Special Prizes.—Special Prizes, of which details will be announced later, will be given for the best Exhibit from actual working drawings published in "WORK."

Certificates of Merit.—A First Class Certificate and Book Prize of One Guinea will be awarded (1) To the Second Best Exhibit in the Exhibition, (2) To the Second Best Exhibit in Group XIV.; and if recommended by the Jurors, a special extra SILVER MEDAL will in either case be given. A Second Class Certificate will be awarded (1) To the Third Best Exhibit of the Exhibition, (2) To the Third Best Exhibit in Group XIV. N.B.—The Proprietors of "WORK" reserve to themselves the right of publishing in the pages of that Magazine any Essay or Suggestion for which a Prize shall have been awarded.

SECOND CLASS CERTIFICATES will be awarded to the Second Best Exhibit in each Class or Sub-Division of Groups.

THIRD CLASS CERTIFICATES will be awarded to the Third Best Exhibits in each Class or Sub-Division of Groups, and if specially recommended by Jurors, Second Equal Awards in case of Ties of Merit.

Limitation.—It shall, however, be understood, that the highest Prize Medal only shall be given, in lieu of minor honours; but all honours obtained shall be recorded upon the Certificate in each case. *No Prize will be awarded except on the Jurors' recommendation as to merit.*

Exhibitor's Certificate.—Every Exhibitor, whether a Prize Winner or not, will be entitled to a separate Certificate that he has exhibited.

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"WORK" EXHIBITION, 1890-91.

(N.B.—A separate form will be necessary for each Exhibit in any other group.)

Date 189

APPLICATION FOR SPACE.

(TO BE FORWARDED TO SECRETARY AS ADDRESSED ON OTHER SIDE.)

A. Name (in full) .....

Address .....

B. Are you a Reader of "WORK" ..... Age ..... Trade .....

C. State here whether you exhibit as Master, Journeyman, Apprentice, or Amateur .....

If a Tradesman, how long at Trade .....

If an Employé, state present Employer's Name and Address .....

.....

D. State GROUP under which your Exhibit comes. GROUP ..... CLASS* .....

E. Here describe, succinctly, your Exhibit and its purpose. TITLE .....

.....

F. If not entirely made by you, state what portion you have actually made .....

G. State space required :—

Wall space—Height ..... ft. ..... in. Depth ..... ft. ..... in. Width ..... ft. ..... in.

Floor space—Height ..... ft. ..... in. Depth ..... ft. ..... in. Width ..... ft. ..... in.

Table space—Height ..... ft. ..... in. Depth ..... ft. ..... in. Width ..... ft. ..... in.

H. State if your employer authorised your work to be done in his workshop—(Yes or No) .....

I. State price at which you are willing to sell your Exhibit, £ .....

J. You hereby agree to accept the Jurors' awards as final and binding without appeal .....

Signature of Witness† *(in full)* .....

Address .....

Occupation .....

Signature of Exhibitor (in full) .....

* Leave this space blank to be filled in by Secretary.

† Witness must believe the statement above made by the Exhibitor to be true in every particular.

Leave blank this Counterfoil for Secretary's References, &c.

Group .....

No ..... *on Register.*

Date .....

Jurors' Award .....

Letter Book Folios .....

Ledger Folio .....

Receipt of Package .....

Date .....

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